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EXPLANATIONS AND SAILING DIRECTIONS

TO ACCOMPANY THE

WIND AND CURRENT CHARTS,

APPROVED BY

COMMODORE CHARLES MORRIS,

CHIEF OF THE BUREAU OF ORDNANCE AND HYDROGRAPHY;

AND PUBLISHED BY AUTHORITY OF

HON. J. C. DOBBIN,

SECRETARY OF THE NAVY.

BY

M. F. MAURY, LL.D., LIEUT. U.S.N.,

SUPERINTENDENT OF THE U. S. N. OBSERVATORY

AND HYDROGRAPHICAL OFFICE,

WASHINGTON.

SEVENTH EDITION—ENLARGED AND IMPROVED.

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INTRODUCTION.

The introduction of a book, though the first in order to the reader, is generally the last to the writer; at least it is so in the present instance, and it is proper to state the fact in order to explain and apologize for the appearance of matter here, which otherwise would seem out of place, as it might be considered to belong more properly to the body of the work. This work is the fruit of common labors. By concert and with the most commendable spirit, sailors of all nations are engaged in conducting a most noble and ennobling system of philosophical inquiry, the results of which, so far, have been embodied in the publications of this office; and for them to hear that the cause they have in hand is making good progress, first in this part of the world, then in that, is surely most encouraging.

But before I go further, I wish to announce a rule of conduct by which I have been guided from the commencement of this work, and by which I mean to be guided to the end; for not only has experience proved it wise, but it is in principle so good that to it I attribute much of the success which has attended these labors. This rule has been to keep the mind unbiassed by theories and speculations; never to have any wish that an investigation would result in favor of this view, in preference to that, and never to attempt by premature speculation to anticipate the results of investigation, but always to trust to the observations.

After these have been discussed, until the phenomena they conceal have been sufficiently developed, or developed as far as the materials on hand were capable of developing them, then, and not till then, has an explanation been sought. The plan has been first the fact, and then the cause; and in seeking to account for any one fact, though several explanations may present themselves, that one is preferred which, besides satisfying the case in hand, will serve also to explain the greatest number of other known facts. And even then, such explanation is offered only in place of a better, and it is held only until another, come whence it may, is presented, which will reconcile equally as well a still greater number of facts. In truth, these investigations have been strict investigations for facts, with the full conviction that facts, when grouped together in sufficient numbers, and catechized with reverence, will themselves reveal their cause, or place in our hands the clew to such explanation as man is permitted to comprehend.

In some cases, hypothesis is not only wholesome in its bearings, but necessary to progress. When I have deemed such to be the case, I have felt it my duty to offer hypothesis. But whenever, in this

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work, I have ventured an hypothesis, it has been for the purpose of stimulating observers or thinkers, expecting thus to make a step towards some hidden truth, by proving the hypothesis wrong, or by proving it right, for in either case there is generally a triumph and a step gained. That such will be the spirit among those who, in foreign countries, are about to participate with me in the labors of discussion, I feel confident when I consider the character of the men and institutions employed, such as the Royal Academy of Sciences in Sweden, such as Beechey and Fitzroy and Playfair in England, Ballot and Jansen and Van Galen in Holland, Wrangell and Gorkovenko in Russia, and Pegado in Portugal. And that such has been the spirit presiding over this beautiful system of investigation, I hope the pages of these Sailing Directions, and the face of the "Wind and Current Charts" themselves have shown. The facts they contain I believe to be true and faithful results of what the log-books contain, and so believing I will not yield them for any others, unless these others be derived from a greater number of observations, from more faithfully kept abstract logs, or from some more thorough system of investigation. But as for theory, if I have anywhere carried theory where the scaffolding of abstract logs and pertinent facts is not sufficient to support me, I am, as I have been and hope to be, most happy to see sound opinion take its place.

I reverence truth, and know that this work which I have so much at heart, and which has cost me so many hours of precious time, will stand, prosper and flourish only as I am right and it is true. Such are the principles which have guided me in its progress, and to the observance of which I attribute whatever of success or of good, has been awarded to it.

An account of the progress made with the Winds and Currents of the Sea, up to the time of putting this volume to press, is contained in the body of the work, and I have thought well to avail myself of the privileges of the introduction, to report the progress since made, and to review plans and prospects for the future. This review shall be neither long nor tedious; and, to be properly understood, it should not be read until the contents of the book have been examined.

The demand for the fruits of our labor is continually on the increase; 140,000 sheets of the Wind and Current Charts have been distributed; and the three thousand copies of the 6th edition of Sailing Directions that were published a little more than a year ago, have been exhausted. The work has met with favor in all parts of the commercial world. The most experienced seamen, the ablest navigators, the wisest philosophers, and the greatest statesmen, and the most powerful nations, have given it not only their approval, but they have lent it their aid, and given it encouragement also.

It has already been stated, that all nations that may be called maritime, except France, are co-operating with us through their navies and merchantmen, in making the required observations and keeping the abstract log, and that some of these—as Spain, Portugal, and Holland, England and Denmark, Norway and Sweden—have gone further, and provided for a discussion of the sea journals returned from their shipping, and for the contribution to the general stock of the results that may be obtained therefrom. But pp. 211–12, which contain that statement, went to press more than a month ago; and since they were written, accounts of what is in progress elsewhere have been received, and it is a most encouraging circumstance to find that our labors have enlisted for their further prosecution, not only the active

co-operation of governments, fleets, and navies, but that they have on their side the sympathies of communities and humane individuals also.

In addition to the account already given as to the progress which the Wind and Current Chart cause is making abroad, I now have the gratification of stating that Prussia entertains the idea of establishing a Hydrographical Office, for the purpose of entering the field of discussion as well as that of observation; that Russia is about to do the same, with Baron Wrangell at the head of it, which is a sure guarantee to the nautical world that it will be well and ably conducted. With the assistance of Captain Gorkovenko, the same who represented Russia in the Brussels Conference, that distinguished admiral is now engaged in translating from this work, and rendering it, with the formula of the abstract log, into Russian, for the use of the imperial marine.

The Holy See has established a decoration for the seamen of the Papal states, which can be reached only by keeping the abstract log of the Brussels Conference; and a society has been established for the encouragement of nautical science in that country.*

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* NOTICE.

Translation.

"PONTIFICAL GOVERNMENT,

Ministry of Commerce and Public Works.

"Among the subjects which have always received the attention and care of the Pontifical Government, not the least has been that of the Mercantile Marine, and wishing to encourage, as much as possible, those who, by their industry, their courage, and their conduct, shall contribute to the increase and development of this marine, the council of ministers having proposed and received the special sanction of His Holiness, do arrange and decree as follows:—

ART. 1. Honorary distinctions shall henceforth be accorded to such captains of armed or mercantile ships of the Pontificate as shall have merited well of their State and Sovereign.

ART. 2. Every Pontifical subject who, on his own account, shall ship, in quantities of not less than 300 tons per vessel, a thousand or more tons of merchandise, in vessels entirely equipped and constructed in the dock-yards of the State, according to the law of Dec. 10, 1825, shall, besides the reward of construction, be entitled to an honorary distinction by the Pontifical Government.

ART. 3. Two flags, or honorary distinctions, are instituted; one of the first, the other of the second class, to be given to those captains who, legally qualified for the *gran corso o lungo corso*, shall make distant voyages.

ART. 4. The form of these flags shall be the following:—

Those of the first class shall be yellow and white—the yellow being nearest the staff—turned up with a red band, and in the middle the full length figures of the Holy Apostles Peter and Paul.

Those of the second class shall be all white, turned up with a yellow band, and in the middle the full length figures of the Holy Apostles Peter and Paul.

ART. 5. The dimensions of the flags shall be regulated by the size and quality of the ship; but their length shall be once and a half times, and the border one-sixth of their breadth.

ART. 6. These flags, or honorary distinctions, shall be hoisted at the mast-head by the captains to whom they are given; those of the first class at the head of the mainmast, and those of the second class, at the head of the mizzen. But neither of these flags shall be hoisted without, at the same time, hoisting the flag of the State at the peak, in accordance with the law of Sept. 17, 1825.

ART. 7. In order to obtain the honor of these flags, the sea captains of the Pontificate must prove, from documents of the proper authorities of the State, or its representatives abroad, or, in their absence, of those of friendly powers, that they have made, in ships registered in the Pontifical State and duly qualified for "il lungo corso é il gran corso," a given number of voyages to foreign ports, leaving the Pontifical ports with merchandise of the State, and returning with foreign merchandise.

It is also required of captains who shall wish to obtain the said distinctions, either of the first or second class, that they shall keep, especially in voyages out of the Straits of Gibraltar, a meteorological journal, with observations made daily at four o'clock in the morn-

The solid men of Rotterdam invited one of their number, Dr. Van Galen, well known in the scientific world, to deliver lectures for the information of seamen, upon the object of the Wind and Current Charts. The course embodied so much useful information, that the merchants and ship-owners of that commercial city caused it to be published and gratuitously circulated for the better information of Dutch seamen. And thus the services of many valuable observers have been obtained—for the Dutch navigators are skilful and faithful observers.

More recently, one of these lectures has been translated, expanded, and beautifully illustrated with plates, by Mrs. Janet Taylor, 104 Minories, London. It is intended to interest British sailors, and to enlist their co-operation by making them acquainted with the subject, the object in view, the results obtained, the promise of more, and the plan of operations.

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ing, at noon, and at eight in the evening. The Minister of Commerce will, through the Board of Health and Police, in the ports of Ancona and Civita Vecchia, furnish gratuitously to shipmasters undertaking such voyages, the form of the journal, with requisite printed instructions for its compilation. At the return of the ship to the port whence it started, the officials of the port shall, without delay, receive back the original of this journal, signed by the captain and his secretary, whence it shall be forthwith transmitted to the said minister for its proper use.

Art. 8. The foreign ports to which the captains may sail in order to obtain the flags, are classified into the following four categories:—

1. Ports of the Black Sea.

2. Ports of Spain, France, Belgium, Holland, and English seaports, ports of the Baltic, and African seaports, as far as the Cape of Good Hope.

3. Atlantic seaports of North and South America, and ports of the Arctic Ocean.

4. Ports of India and the Great Southern Ocean.

Art. 9. The honor of the flags shall be awarded with a certificate from the Minister of Commerce, when the following voyages shall be proved to have been made according to Art. 7:—

To obtain that of the first class—

Either one voyage of the fourth category, or three of the third, or five of the second.

To obtain that of the second class—

Either one voyage of the third category, or two of the second, or four of the first.

Art. 10. To any merchant captain who shall have made four voyages of the third category, or two of the fourth, according to Art. 8, besides the flag of honor of the first class, shall be given the right to wear the official uniform of the navy of the Pontificate, with the rank of honorary lieutenant.

Art. 11. When a vessel, carrying one of these flags of honor, approaches a Pontifical port, it shall be saluted by the port-ship by hoisting the Pontifical flag at the head of the mainmast, or mizzen, according to the class to which the flag of honor belongs. If, also, the captain of the ship shall have the rank of lieutenant in the navy, he shall receive, in addition, the salute of three guns.

Art. 12. In cases of extraordinary voyages, or those not contemplated above; or of very honorable actions performed by captains, which shall redound to the honor of the service and the glory of the Pontifical flag, the Government reserves the reward of these for special action.

Art. 13. The present arrangements shall not apply to voyages now in progress, or those anterior to the date of this notification.

Art. 14. The Board of Health and Police of the ports of Ancona and Civita Vecchia, and the Consular Pontifical representatives abroad, are charged with the execution of these arrangements, each for the part which appertains to him.

Given at Rome, from the Ministry of Commerce and Public Works, January 8, 1855.

The Minister,

G. MILESI."

In this connection, the following statement is interesting; it shows the estimated number of vessels and amount of tonnage belonging to the various States of Christendom:—

THAT ARE CO-OPERATING.	VESSELS.	TONNAGE.	THAT ARE NOT CO-OPERATING.	VESSELS.	TONNAGE.
England	36,000	5,100,000	France	14,400	720,000
United States*	25,000	4,803,000	Tuscany and Naples	8,000	270,000
Russia	800	240,000	Greece	4,000	265,000
Sweden and Norway	2,100	550,000	German Principalities	700	75,000
Denmark	4,000	200,000	Sandwich Islands, &c.	600	70,000
Holland	2,100	460,000		27,700	1,400,000
Belgium	150	36,000			
Prussia	2,000	370,000			
Hamburg	2,400	220,000			
Bremen	500	160,000			
Portugal	800	90,000			
Spain	8,000	380,000			
Sardinia	4,200	150,000			
Papal States	4,000	120,000			
Austria	7,600	324,000			
Brazil	1,700	75,000			
Chili	200	25,000			
Peru	250	30,000			
	101,800	13,333,000			

This estimate includes coasters, fishing-smacks, river craft, and vessels of all sorts that the government takes cognizance of. Of this grand total of 129,500 vessels and 14,733,000 tons, the nations to which very nearly nine-tenths of the tonnage belongs have already joined hands, and are co-operating with us in collecting materials for the further prosecution of these researches. These vessels employ not less than a million of men and boys. Perhaps not more than one-tenth of the vessels are engaged in foreign trade, or perform voyages during which observations useful to us might be made; and, of this tenth, perhaps not more than one-half are capable of contributing. Nevertheless, after allowing for these deductions, the size of the fleets that will probably be engaged in this work, in the course of a few years, is imposing. It is the largest fleet that has ever been seen to act in concert, for any purpose whatever, since the world began.

Thus, all who have lent a hand in bringing these investigations to their present state, have cause for mutual congratulation, for the work goes bravely on; and friends to encourage by precept, or to help with

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* The number of vessels belonging to the United States is estimated. The tonnage is according to official documents.

contributions, are springing up in all parts of the world. But, in reviewing our labors, our object is not to boast or to rejoice, it is to gather strength to do more and to do it better; for the eyes of good men are upon us.

We are investigating the laws of the atmosphere. It covers the land as well as the sea. It is a whole, and for its influences to be rightly understood it must be treated as a whole: for it would be quite as reasonable to expect, by observing the currents of the Mediterranean, to gain a complete knowledge of those of the whole ocean, as it is to expect, by observing the winds at sea, to understand the movements of the whole atmosphere.

Often, in the course of these investigations, I have been compelled to give up a most interesting inquiry, because the observations that relate to it do not extend beyond the sea. I find, for instance, in the abstract logs, some phenomenon or another recorded which I am induced to trace to its genesis. I follow it up, trace it from the sea to the land, and there, having it almost within my grasp, yet have to let it escape for the want of corresponding observations. This ought not to be. Agricultural and sanitary meteorology is as important as nautical. Farmers and invalids are quite as much interested in the development of meteorological facts on the land, as merchants and sailors are on the sea. The farmers and the *savans* of the shore are therefore appealed to, to come up, join forces, and do for the land what seamen and shipping merchants have done for the sea.

The investigations for the land may be carried on in a way quite as unexpensive as those for the sea; but it is as necessary in one case as the other, that governments should lead. The states of Christendom were invited to a conference upon the subject of a uniform system of observations at sea. After three weeks of free discussion and deliberation, a system was agreed upon; and nations owning nine-tenths of all the shipping in the world are now, through their navies and the voluntary co-operation of their merchantmen, engaged in carrying out that system; the governments simply undertaking the office expenses incident to the discussion and publication of the observations that are thus gratuitously made.

There are public-spirited men ashore, and amateur meteorologists on the land in all countries, who, I am assured, would be most happy, at their own expense, to equip their meteorological observatories with the requisite instruments, and to observe according to a prescribed and uniform plan, provided the government would agree to have the observations so made compared, discussed, and published, for the benefit of the world. Every nation has already, and upon a scale more or less extensive, its own meteorological observatories on the shore; they have also an office in which the observations are treated with more or less care, and published in some shape or another. So that, different from the system at sea, the nuclei for the observations on the land, their treatment and publication, are already established; and to cover both sea and land with observers and to make the plan universal, but little now is wanting save that spirit of good will and co-operation for the land which has been found so beneficial and admirable for the sea.

The Lords' Committee of the Privy Council for Trade, in England, appreciating the importance of the subject, addressed, last summer, a letter to the President and Council of the Royal Society, requesting their views. I give the correspondence as far as I am enabled to do, regretting that I have not the replies of MM. Quetelet, Erman, Heis, and Kriel to include in it, as well as my own.

ROYAL SOCIETY'S APARTMENTS, SOMERSET HOUSE,
LONDON, *June* 19, 1854.

SIR: I have the honor to inclose a letter which has been received by the President and Council of the Royal Society of London, announcing the intention of the British Government to institute an office for the discussion of the observations on meteorology to be made at sea in all parts of the globe by British vessels in conformity with the recommendation of the Conference held at Brussels last year, and requesting the opinion of the Royal Society as to the expediency of giving such an extension to the system of meteorological observations as may cause it to include in addition to the information required for the purposes of navigation, such scientific desiderata as may be decided best calculated for the investigation and establishment of great atmospheric and oceanic laws, and may be obtainable by observation either on land or at sea.

The inquiry thus opened being one of general concernment, the President and Council of the Royal Society, before they make their reply, are desirous of obtaining the opinion of those amongst their foreign members, who are known as distinguished cultivators of meteorological science, as well as of others in foreign countries, who either hold offices connected with the advancement of meteorology, or have devoted themselves to this branch of science and may thus be consulted with advantage.

In addressing this letter to you, Sir, I have therefore to express the gratification with which the Royal Society will receive a communication from you; and to assure you that the fullest consideration will be given to the opinions or suggestions with which you may be pleased to favor them.

I have the honor to be, sir,
Your obedient servant,
(Signed) ROSSE.

P. S. In addressing your reply, be pleased to write "meteorology" in the corner of the direction. The English language need not be used unless perfectly agreeable to yourself.

To LIEUT. MAURY, U. S. N.

OFFICE OF COMMITTEE OF PRIVY COUNCIL FOR TRADE,
MARINE DEPARTMENT, *June* 3, 1854.

SIR: I am directed by the Lords of the Committee of the Privy Council for trade, to acquaint you that with the concurrence of the Lords Commissioners of the Treasury, my Lords have determined to submit to Parliament an estimate for an office for the discussion of the observations on meteorology which it is proposed shall be made at sea, in all parts of the globe, in conformity with the recommendation of the Conference held at Brussels last year, and they are about to construct a set of forms for the use of that office, in which it is proposed to publish from time to time and to circulate such statistical results as may be considered most desirable by men learned in the science of meteorology, in addition to such other information, as may be required for the purposes of navigation.

Before doing so, however, they are desirous of having the opinion of the Royal Society as to what are the great desiderata in meteorology, and as to what forms that Society consider the best calculated to exhibit the great atmospheric laws, which it may be deemed most desirable to develop.

I herewith inclose a form of log (this is in the Report of the Brussels Conference) which will contain all that it is proposed to execute at sea, but it may possibly happen that observations on land, upon an extended scale, may hereafter be made and discussed in the same office; and in framing your reply, it is desirable that such a contingency should be borne in mind and provided for.

I am, sir,

Your obedient servant,

To the Secretary of the Royal Society. (Signed) JAMES BOOTH.

NATIONAL OBSERVATORY,

Washington, July 27, 1854.

TO THE HONORABLE LORD ROSSE,

President of the Royal Society, London.

MY LORD: I have had the honor to receive your Lordship's communication of the 19th June, 1854, covering a copy of one of the 3d June, 1854, made by command of the Lords of the Committee of Privy Council for Trade, to the Royal Society, concerning meteorological observations by sea and land.

The British Government having determined to institute an office for the discussion of observations to be made in conformity with the recommendations of the Maritime Conference of Brussels, solicits the opinion of the President and Council of the Royal Society, as to the expediency of enlarging the plan so as to include such scientific desiderata as may be deemed best calculated for the investigation and establishment of great atmospherical and oceanic laws, and which may be obtained by observations either on land or at sea.

Before expressing their views in reply, the President and Council of the Royal Society desire to obtain the opinion, among others, of those in foreign countries, who either hold offices connected with meteorological research, or who have devoted themselves to this branch of science.

In furtherance of this desire, your Lordship has done me the honor to address the communication aforesaid. I think my opinion is scarcely worth the having, though as the President and Council of the Royal Society are pleased to think differently, I do not feel myself quite at liberty to set the example of withholding small mites.

In my judgment, the best plan of procedure for procuring such expansion for the system of meteorological observations as will include the desiderata indicated, is, to carry out the idea of a universal system of meteorological observations, which formed the subject of correspondence between the Governments of Great Britain and America in 1851.

The Brussels Conference recommended a mode for carrying out this system in so far as it relates to

the sea. No less than twelve nations have approved these recommendations, and have signified their intentions of carrying them out through the instrumentality of their naval and mercantile marine.

By referring to the detail of the plan of the Brussels Conference, it will be perceived that it is somewhat in the nature of a compact. In carrying out this plan, much is expected of the merchant service. We look to this branch for a large and valuable corps of observers; and to the merchantmen, the plan especially in this country is recommendatory, for the government has no power to *require* services of the kind from American or other shipmasters. The American Government, therefore, has caused it to be proclaimed, that it will grant certain works to the intelligent shipmasters of any country, who will render abstract logs according to a prescribed formula.* Merchant-service observers are invited to give more than this formula requires; but to *demand* more might, under present circumstances, be considered not altogether fair.

This is one reason why the recommendations of the Brussels Conference should be adhered to at least for the present, but there is another.

Nations owning more than nine-tenths of all the shipping in the world have come into this plan. Arrangements for carrying it out have either just been made, or are in progress, and I should tremble with apprehension were the idea to get abroad that this plan is to be changed, or that a proposition was seriously entertained at this early day for altering or amending it, or for materially interfering in any manner whatever with the arrangements which are in progress for carrying it out.

The plan proposed by the Maritime Conference of Brussels may be faulty, it no doubt is. My reluctance to any alterations, my opposition to any material amendment to it whatever, does not grow out of any idea that I may entertain as to its completeness of purpose, or its perfection, but from the fact that with it we have on hand a grand experiment; it is an attempt to bring the sea, by means of machinery already at work, regularly within the domains of systematic and scientific research; to change without cost the common implements of navigation into philosophical instruments, and to convert the ships, for the safety of which these instruments are employed, into so many floating observatories all co-operating together for the advancement of science and the good of mankind.

After this plan has been tried, after we shall have had an opportunity of ascertaining by actual trial the degree of skill possessed or attainable by such a corps of observers, and after experience shall have afforded us the benefit of its lights as to the workings of this scheme, then no one will be more ready than myself to profit by these lights, and to go into another conference for amendments and improvements.

I take it for granted, therefore, that the points of inquiry now presented, do not involve any question that relates to any alteration or amendment in the plan of the Brussels Conference [*at present*].

The subjects upon which opinions are invited relate, according to my view, to concert of action among

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* *Vide* a letter from Secretary of the Navy, Dec. 6, 1851, page 11 of pamphlet, on the establishment of a system of meteorological observations by land and sea.

meteorologists and meteorological observers on the land, as to how far they may assist in carrying out this plan, while at the same time the field may be enlarged so as to include observations on the sea also.

This would make the plan complete, and an inquiry like this, having for its object the establishment of great atmospherical and oceanic laws, being, as the President and Council remark "of general concernment," ought to be undertaken under governmental auspices, for I conceive that neither individual enterprise, nor the activity of societies, can do much more than accomplish specialities in so great a field as the atmosphere.

It is a whole; as a whole its workings and its laws should be investigated, and as a whole it should be occupied with observers and treated by computers.

Therefore, I am among those who advocate another meteorological Congress, for the purpose of arranging forms for observers and recommending a plan for co-operation on the land. In my judgment, co-operation, to the extent desired, is only obtainable by bringing meteorologists together for mutual consultation and advice, with the assurance that should their counsels be judged practicable, enlightened nations stand ready to adopt and carry them out.

This Congress should, I conceive, be international; that is, the members of it should be appointed by those governments that may be disposed to lend their co-operation or their countenance, to a scheme so rich with the promise of universal good.

Men have entered this field single handed, and gathered laurels in abundance; but they with their labors have satisfied us that, though there still remains a harvest rich and plenteous, they are not, after reaping it and gathering it together, equal also to the task of threshing it; for with such gleanings it requires patient labor to separate the wheat from the chaff. For such a field and harvest, multitudes of laborers are wanted; they are wanted in numbers that will not come at the call of individuals or societies, however wise and excellent, but only at the call of nations. Indeed, it is not so difficult to procure meteorological observations, as it is to have them properly discussed and published.

Wherever the English language is spoken, wherever Christian churches have their missionaries, and science its followers, there are to be found laborers ready to enter this field.

"Man by nature is a meteorologist," but no man likes to labor in vain; and when men are invited to enter this field as recording observers, to whom, or to what office shall each one be directed to send his observations, that they may be prepared and discussed for use; so that none shall have labored in vain?

Almost every government among the states of Christendom has already established its system of meteorological observations, and has also provided to a greater or less extent for their publication. These observations are made for the most part at hospitals, military posts, and public institutions and establishments of various kinds. Many of them are well furnished with self-registering instruments. They therefore constitute what, in the proposed plan, may be called government establishments. They occupy on the land the place which, in the Brussels plan, the man-of-war occupies on the sea, where the most complete meteorological journals may be kept.

Many private observatories are, like many merchant ships, equally well fitted and found, and ready to undertake a series of observations according to the most elaborate formula that may be thought desirable. But the great body of laborers on the land, like the great majority of co-operators at sea, will be observers only of the minimum order. Many of these will be prepared to furnish such data alone as the eye, assisted by the thermometer and judgment, may gather. But even such observations—especially in a comprehensive system, one object of which is to develop the great laws and plan of atmospherical circulation—will be far from useless; for the value of such will be greatly enhanced by geographical position or by the numbers of the stations at which they may be made.

The British Government has taken the lead in the plan of concert of action among meteorologists on the land. The plan could not be in better hands, nor could it be brought forward under better auspices. Such a system of research, though it may be as extensive as the air, and though it may look to the establishment of meteorological observatories in all habitable parts of the globe, is simple, and, in my judgment, is susceptible of ready and successful execution without any more than really a trifling expense.

I beg to make myself clear upon this point, and, that I may do so, crave indulgence for an illustration.

Most of the governments, it is presumed, that will be represented in the proposed congress, have already a system of meteorological observations, which they are in the habit of publishing more or less in detail. The formula of observations for these establishments should be the most comprehensive: but each government, upon whose territories the Congress may deem it advisable to multiply stations, should encourage the establishment of them, by such means as to it may seem good; let the Congress, however, propose a form for these also—a minimum of desiderata—with the suggestion that each government invite its amateur meteorologists to co-operate in this plan, at least so far as to satisfy the minimum formula with observations; accompanying the invitation with an offer to every co-operator of a copy of published results.

In case there be any governments, as there probably will be, that may not find it convenient or deem it expedient to make such publications of the observations to be made within its dominions; then let the British Government do for the land what another government of kindred people has done for the sea, viz: offer to take charge of all the observations that no other government shall care for, discuss them, and send to each one whose labors may be there recorded, a copy of the printed results.

What instruments shall be used at the stations, public and private, what forms of observation, and what the subjects, in short what the details of the plan may be, should be left for the deliberations of a meeting of meteorologists, invited for the purpose and representing nationalities. I conceive it very desirable, that so far as it may be practicable without interfering with the Brussels plan, that the proposed plan for the land should contemplate co-operation between the observers ashore and afloat; for in discussing the observations at sea, I am daily reminded of the want of such co-operation on the land. There are many phenomena that cannot well be traced out, without such concert. I hope I may be excused for mentioning a case, that just now happens to be before me.

I have lately received from Commodore Mayo, in command of the African squadron, a meteorological journal, kept at the American Mission, Gaboon, for 1852 and 1853, by Dr. Henry Ford; by which it

appears that the dry season there is from June to September inclusive, that the other eight months comprise the rainy season. Now, though this journal does not give the direction of the wind at all, and though it only makes record of the thermometer, the rains, and state of sky, yet by referring to our investigations at sea, it appears that this prolonged rainy season is due to two causes which operate in succession; one a monsoon which brings rain, and before that is over, the equatorial cloud ring in its annual vibrations from north to south has overshadowed Gaboon (lat. 0° 22′ N.) with its vapors, and thus, like the lunar and solar tides when in conjunction, we have one rainy season overriding and overleaping another.

Begging pardon for having said so much in a case upon which there was need of but little from me, I have the honor to be, Respectfully, &c.

(Signed) M. F. MAURY.

Reply of the President and Council of the Royal Society to a Letter from the Board of Trade, dated Jan. 15, (*June* 3, ?) 1854.

ROYAL SOCIETY, SOMERSET HOUSE,
February 22, 1855.

SIR: In the month of June last, the Lords of the Committee of the Privy Council for Trade caused a letter to be addressed to the President and Council of the Royal Society, acquainting them that their Lordships were about to submit to Parliament an estimate for an office for the discussion of the observations on meteorology, to be made at sea in all parts of the globe, in conformity with the recommendation of a conference held at Brussels in 1853; and that they were about to construct a set of forms for the use of that office, in which they proposed to publish from time to time, and to circulate such statistical results obtained by means of the observations referred to, as might be considered most desirable by men learned in the science of meteorology, in addition to such other information as might be required for the purposes of navigation.

Before doing so, however, their Lordships were desirous of having the opinion of the Royal Society, as to what were the great desiderata in meteorological science; and as to the forms which may be best calculated to exhibit the great atmospheric laws which it may be most desirable to develop.

Their Lordships further state, that as it may possibly happen that observations on land upon an extended scale may hereafter be made and discussed in the same office, it is desirable that the reply of the Royal Society should keep in view, and provide for such a contingency.

Deeply impressed with a sense of the magnitude and importance of the work which has been thus undertaken by Her Majesty's Government and confided to the Board of Trade, and fully appreciating the honor of being consulted, and the responsibility of the reply which they are called upon to make; considering also that by including the contingency of *land* observations, the inquiry is, in fact, coextensive with the requirements of meteorology over all accessible parts of the earth's surface; the President and Council of the Royal Society deemed it advisable, before making their reply, to obtain the opinion of those

amongst their foreign members who are known as distinguished cultivators of meteorological science, as well as of others in foreign countries, who either hold offices connected with the advancement of meteorology, or have otherwise devoted themselves to this branch of science.

A circular was accordingly addressed to several gentlemen whose names were transmitted to the Board of Trade in June last, containing a copy of the communication from the Board of Trade, and a request to be favored with any suggestions which might aid Her Majesty's Government in an undertaking which was obviously one of general concernment.

Replies in some degree of detail have been received from five of these gentlemen,* copies of which are herewith transmitted.

The President and Council are glad to avail themselves of this opportunity of expressing their acknowledgments to these gentlemen, and more particularly to Professor Dové, director of the meteorological establishments and institutions in Prussia, whose zeal for the advancement of meteorology induced him to repair personally to England, and to join himself to the Committee by whom the present reply has been prepared. Those who are most familiar with the labors and writings of this eminent meteorologist will best be able to appreciate the value of his co-operation.

The President and Council have considered it as the most convenient course to divide their reply under the different heads into which the subject naturally branches. But before they proceed to treat of these, they wish to remark generally, that one of the chief impediments to the advancement of meteorology consists in the very slow progress which is made in the transmission from one country to another of the observations and discussions on which, under the fostering aid of different governments, so much labor is bestowed in Europe and America; and they would therefore recommend that such steps as may appear desirable should be taken by Her Majesty's Government, to promote and facilitate the mutual interchange of meteorological publications emanating from the governments of different countries.

Barometer.—It is known that considerable differences, apparently of a permanent character, are found to exist in the mean barometric pressure in different places; and that the periodical variations in the pressure in different months and seasons at the same place, are very different in different parts of the globe, both as respects period and amount; insomuch that, in extreme cases, the variations have even opposite features in regard to period, in places situated in the same hemisphere, and at equal distances from the equator.

For the purpose of extending our knowledge of the facts of these departures from the state of equilibrium, and of more fully investigating the causes thereof, it is desirable to obtain, by means of barometric observations strictly comparable with each other, and extending over all parts of the globe accessible by land or sea, *tables*, showing the mean barometric pressure *in the year*, *in each month of the year*, and *in the four meteorological seasons*—on land, at all stations of observation—and at sea, corresponding to the middle points of spaces bounded by geographical latitudes and longitudes, not far distant from each other.

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* **Dr. Erman, of Berlin; Dr. Heis, of Münster; Prof. Kriel, of Vienna; Lieut. Maury, of Washington; and M. Quetelet, of Brussels.**

The manner of forming such tables from the marine observations which are now proposed to be made, by collecting together observations of the same month in separate ledgers, each of which should correspond to a *geographical space* comprised between specified meridians and parallels, and to a *particular month*, is too obvious to require to be further dwelt upon. The distances apart of the meridians and parallels will require to be varied in different parts of the globe, so that the magnitudes of the spaces which they inclose, and for each of which a table will be formed, may be more circumscribed when the rapidity of the variation of the particular phenomenon to be elucidated is greatest in regard to geographical space. Their magnitude will also necessarily vary with the number of observations which it may be possible to collect in each space, inasmuch as it is well known that there are extensive portions of the ocean which are scarcely ever traversed by ships, whilst other portions may be viewed as the highways of a constant traffic.

The strict comparability of observations made in different ships, may perhaps be best assured by limiting the examination of the instruments to comparisons which it is proposed to make at the Kew Observatory, before and after their employment in particular ships. From the nature of their construction, the barometers with which Her Majesty's navy and the mercantile marine are to be supplied are not very liable to derangement, except from such accidents as would destroy them altogether. Under present arrangements, they will all be carefully compared at Kew before they are sent to the Admiralty or to the Board of Trade; and similar arrangements may easily be made by which they may be returned to Kew for re-examination, at the expiration of each tour of service. The comparison of barometers when embarked and in use, with standards, or supposed standards at ports which the vessels may visit, entails many inconveniences, and is in many respects a far less satisfactory method. The limitation here recommended is not, however, to be understood as applicable in the case of other establishments than Kew, where a special provision may be made for an equally careful and correct examination.

At land stations, in addition to proper measures to assure the correctness of the barometer, and consequent comparability of the observations, care should be taken to ascertain by the best possible means (independently of the barometer itself), the height of the station above the level of the sea at some stated locality. For this purpose the extension of levels for the construction of railroads will often afford facilities.

It may be desirable to indicate some of the localities where the data, which tables such as those which have been spoken of would exhibit, are required for the solution of problems of immediate interest.

1°. It is known, that, over the Atlantic Ocean, a low mean annual pressure exists near the equator, and a high pressure at the north and south borders of the torrid zone (23° to 30° north and south latitudes); and it is probable that from similar causes similar phenomena exist over the corresponding latitudes in the Pacific Ocean; the few observations which we possess are in accord with this supposition; but the extent of space covered by the Pacific is large, and the observations are few; they may be expected to be greatly increased by the means now contemplated. But it is particularly over the Indian Ocean, both at the equator and at the borders of the torrid zone, that the phenomena of the barometric pressure, not only annual, but also monthly, require elucidation by observations. The trade-winds, which would prevail

generally round the globe if it were wholly covered by a surface of water, are interrupted by the large continental spaces in Asia and Australia, and give place to the phenomena of monsoons, which are the indirect results of the heating action of the sun's rays on those continental spaces. These are the causes of that displacement of the trade-winds, and substitution of a current flowing in another direction, which occasion the atmospheric phenomena over the Indian Ocean, and on the north and south sides of that Ocean, to be different from those in corresponding localities over, and on either side of the equator in the Atlantic Ocean, and (probably generally also) in the Pacific Ocean.

It is important alike to navigation and to general science, to know the limits where the phenomena of the trade-winds give place to those of the monsoons; and whether any and what variations take place in those limits in different parts of the year. *The barometric variations are intimately connected with the causes of these variations, and require to be known for their more perfect elucidation.*

The importance, indeed, of a full and complete knowledge of the variations which take place in the limits of the trade-winds generally in both hemispheres, at different seasons of the year, has long been recognized. On this account, although the present section is headed "Barometer," it may be well to remark here, that it is desirable that the forms supplied to ships should contain headings, calling forth a special record of the latitude and longitude where the trade-wind is first met with, and where it is first found to fail.

2°. The great extent of continental space in Northern Asia causes, by reason of the great heat of the summer, and the ascending current produced thereby, a remarkable diminution of atmospheric pressure in the summer months, extending in the north to the Polar Sea, and on the European side as far as Moscow. Towards the east, it is known to include the coasts of China and Japan, but the extent of this great diminution of summer pressure beyond the coasts thus named is not known. A determination of the monthly variation of the pressure over the adjacent parts of the Pacific Ocean is therefore a desideratum; and for the same object, it is desirable to have a more accurate knowledge than we now possess of the prevailing direction of the wind in different seasons in the vicinity of the coasts of China and Japan.

3°. With reference to regions or districts of increased or diminished *mean annual* pressure, it is known that, in certain districts in the temperate and polar zones, such as in the vicinity of Cape Horn extending into the Antarctic Polar Ocean, and in the vicinity of Iceland, the mean annual barometric pressure is *considerably* less than the average pressure on the surface of the globe generally; and that anomalous differences, also of considerable amount, exist in the mean annual pressure in different parts of the Arctic Ocean. These all require special attention, with a view to obtain a more perfect knowledge of the facts, in regard to their amount, geographical extension, and variation with the change of seasons, as well as to the elucidation of their causes.

Dry Air and Aqueous Vapor.—The apparently anomalous variations which have been noticed to exist in the mean annual barometric pressure, and in its distribution in the different seasons and months of the year, are also found to exist in each of the two constituent pressures which conjointly constitute the barometric pressure. In order to study the problems connected with these departures from a state of equilibrium

under their most simple forms—and generally for the true understanding of almost all the great laws of atmospheric change—it is necessary to have a separate knowledge of the two constituents (viz: the pressures of the dry air and of the aqueous vapor) which we are accustomed to measure together by the barometer. This separate knowledge is obtained by means of the hygrometer, which determines the elasticity of the vapor, and leads to the determination of that of the dry air, by enabling us to deduct the elasticity of the vapor from that of the whole barometric pressure. It is therefore extremely desirable that tables, similar to those recommended under the preceding head of the barometer, should be formed at every land station, and over the ocean at the centres of geographical spaces bounded by certain values of latitude and longitude, for the *annual*, *monthly*, and *season* pressures—1. Of the aqueous vapor; and 2. Of the dry air; each considered separately. Each of the said geographical spaces will require its appropriate ledger for each of the twelve months.

It may be desirable to notice one or two of the problems connected with extensive and important atmospherical laws which may be materially assisted by such tables.

1°. By the operation of causes, which are too well known to require explanation here, the dry air should always have a minimum pressure in the hottest months of the year. But we know that there are places where the contrary prevails, namely, that the pressure of the dry air is greater in summer than in winter. We also know that, when comparison is made between places in the same latitude, and having the same, or very nearly the same, differences of temperature in summer and in winter, the differences between the summer and winter pressures of the dry air are found to be subject to many remarkable anomalies. The variations in the pressure of the dry air do not, therefore, as might be at first imagined, depend altogether on the differences between the summer and winter temperatures at the places where the variations themselves occur. The increased pressure in the hottest months appears rather to point to the existence of an overflow of air in the higher regions of the atmosphere from *lateral sources;* the statical pressure at the base of the column being increased by the augmentation of the superincumbent mass of air arising from an influx in the upper portion. Such lateral sources may well be supposed to be due to *excessive ascensional currents* caused by *excessive summer heats* in certain places of the globe (as, for example, in Central Asia). Now, the lateral overflow from such sources, traversing in the shape of currents the higher regions of the atmosphere, and encountering the well-known general current flowing from the equator towards the pole, has been recently assigned with considerable probability (derived from its correspondence with many otherwise anomalous phenomena already known, and which all receive an explanation from such supposition), to be the original source or primary cause of the *rotating storms* or *cyclones*, so well known in the West Indies and in China under the names of hurricanes and typhoons. A single illustration may be desirable. Let it be supposed that such an excessive ascensional current exists over the greatly heated parts of Asia and Africa in the northern tropical zone—giving rise, in the continuation of the same zone over the Atlantic Ocean, to a lateral current in the upper regions; this would then be a current prevailing in those regions from east to west; and it would encounter over the Atlantic Ocean the well-known upper current proceeding from the equator towards the pole, which is a current from the southwest. An easterly current

impinging on a southwest current may give rise, by well-known laws, to a rotatory motion in the atmosphere, of which the direction may be the same as that which characterizes the cyclones of the northern hemisphere. To test the accuracy of this explanation, we desire to be acquainted with the variations which the *mean pressure of the dry air undergoes in the different seasons* in the part of the globe where, according to this explanation, considerable variations having particular characters, ought to be found.

2°. We have named one of the explanations which have been recently offered of the primary cause of the northern cyclones. Another mode of explanation has been proposed, by assuming the condensation of large quantities of vapor, and the consequent influx of air to supply the place. In such case, the phenomena are to be tested in considerable measure by the variations which the *other constituent* of the barometric pressure, namely, the *aqueous vapor*, undergoes.

3°. The surface of sea in the southern hemisphere *much* exceeds that in the northern hemisphere. It is therefore probable that, at the season when the sun is over the southern hemisphere, evaporation over the whole surface of the globe is more considerable than in the opposite season when the sun is over the northern hemisphere. Supposing the pressure of the dry air to be a constant, the difference of evaporation in the two seasons may thus produce for the whole globe an *annual barometric variation*, the aggregate barometric pressure over the *whole* surface being highest during the northern winter. The separation of the barometric pressure into its two constituent pressures, would give direct and conclusive evidence of the cause to which such a barometric variation should be ascribed. It would also follow that evaporation being greatest in the south, and condensation greatest in the north, the water which proceeds from south to north in a state of vapor, would have to return to the south in a liquid state, and might possibly exert some discernible influence on the currents of the ocean. The tests by which the truth of the suppositions thus advanced may be determined, are the variations of the meteorological elements in different seasons and months, determined by methods and instruments strictly comparable with each other, and arranged in such tables as have been suggested. A still more direct test would indeed be furnished by the fact (if it could be ascertained), that the quantity of rain which falls in the northern is greater than that which falls in the southern hemisphere; and by examining its distribution into the different months and seasons of its occurrence. Data for such conclusions are as yet very insufficient; they should always, however, form a part of the record at all land stations where registers are kept.

In order that all observations of the elasticity of the aqueous vapor may be strictly comparable, it is desirable that all should be computed by the same tables; those founded upon the experiments of MM. Regnault and Magnus may be most suitably recommended for this purpose, not only on their general merits, but also as being likely to be most generally adopted by observers in other countries.

Temperature of the Air.—Tables of the mean temperature of the air in the year, and in the different months and seasons of the year, at above 1000 stations on the globe, have recently been computed by Professor Dové, and published under the auspices of the Royal Academy of Sciences at Berlin. This work—which is a true model of the method in which a great body of meteorological facts, collected by

different observers and at different times, should be brought together and co-ordinated—has conducted, as is well known, to conclusions of very considerable importance in their bearing on climatology, and on the general laws of the distribution of heat on the surface of the globe. These tables have, however, been formed exclusively from observations made *on land.* For the completion of this great work of physical geography, there is yet wanting a similar investigation for the *oceanic* portion; and this we may hopefully anticipate as likely to be now accomplished by means of the marine observations about to be undertaken. In the case of the temperature of the air, as in that of the atmospheric pressure previously adverted to, the centres of geographical spaces bounded by certain latitudes and longitudes will form points of concentration for observations, which may be made within those spaces, not only by the same but also by different ships; provided that the system be steadily maintained of employing only instruments which shall have been examined, and their intercomparability ascertained, by a competent and responsible authority;—and provided that no observations be used but those in which careful attention shall have been given to the precautions which it will be necessary to adopt, for the purpose of obtaining the correct knowledge of the temperature of the external air, amidst the many disturbing influences from heat and moisture so difficult to escape on board ship. In this respect, additional precautions must be used if *night observations* are to be required, since the ordinary difficulties are necessarily much enhanced by the employment of artificial light. Amongst the instructions which will be required, perhaps there will be none which will need to be more carefully drawn, than those for obtaining the correct temperature of the external air under the continually varying circumstances that present themselves on board ship.

In regard to *land stations*, Professor Dové's tables have shown that data are still pressingly required from the British North American possessions intermediate between the stations of the Arctic Expeditions and those of the United States; and that the deficiency extends across the whole North American continent in those latitudes from the Atlantic to the Pacific. Professor Dové has also indicated as desiderata observations at the British military stations in the Mediterranean (Gibraltar, Malta, and Corfu), and around the coasts of Australia and New Zealand; also that *hourly* observations, continued for at least one year, are particularly required at some one station in the West Indies, to supply the diurnal corrections for existing observations.

Whilst the study of the distribution of heat at the surface of the globe has thus been making progress, in respect to the *mean annual temperature* in different places, and to its *periodical variations* in different parts of the year at the same place, the attention of physical geographers has recently been directed (and with great promise of important results to the material interests of men as well as to general science) to the causes of those fluctuations in the temperature, or departures from its mean or normal state at the same place and at the same period of the year, which have received the name of "non-periodic variations." It is known that these frequently affect extensive portions of the globe at the same time; and are generally, if not always, accompanied by a fluctuation of an opposite character, prevailing at the same time in some adjoining but distant region; so that by the comparison of synchronous observations a progression is traceable, from a locality of maximum increased heat in one region, to one of maximum diminished heat in another region.

For the elucidation of the non-periodic variations even *monthly* means are insufficient; and the necessity has been felt of computing the mean temperatures for periods of much shorter duration. The Meteorological Institutions of those of the European States which have taken the foremost part in the prosecution of meteorology, have in consequence adopted *five-day means*, as the most suitable intermediate gradation between daily and monthly means: and as an evidence of the conviction which is entertained of the value of the conclusions to which this investigation is likely to lead, it has been considered worth while to undertake the prodigious labor of calculating the five-day means of the most reliable existing observations during a century past. This work is already far advanced; and it cannot be too strongly recommended, that at all fixed stations, where observations shall hereafter be made with sufficient care to be worth recording, five-day means may invariably be added to the daily, monthly, and annual means into which the observations are usually collected. The five-day means should always commence with January 1, for the purpose of preserving the uniformity at different stations, which is essential for comparison: in leap years, the period which includes the 29th of February will be of six days.

In treating climatology as a *science*, it is desirable that some correct and convenient mode should be adopted, for computing and expressing the *comparative variability* to which the temperature in different parts of the globe, and in different parts of the year in the same place, is subject from non-periodic causes. The *probable variability*, computed on the same principle as the *probable error* of each of a number of independent observations, has recently been suggested as furnishing an index "of the probable daily non-periodic variation" at the different seasons of the year; and its use in this respect has been exemplified by calculations of the "index" from the five-day means of twelve years of observations at Toronto, in Canada (*Phil. Trans.*, 1853, Art. V.). An index of this description is of course of absolute and general application; supplying the means of comparing the probable variability of the temperature in different seasons at *different places* (where the same method of computation is adopted) as well as at the *same place*. It is desirable that this (or some preferable method if such can be devised for obtaining the same object) should be adopted by those who may desire to make their observations practically useful for sanitary or agricultural purposes or for any of the great variety of objects for which climatic peculiarities are required to be known. Having these three data, viz: the mean annual temperature—its periodical changes in respect to days, months, and seasons—and the measure of its liability to non-periodic (or what would commonly be called, irregular) variations—we may consider that we possess as complete a representation of the climate of any particular place (so far as temperature is concerned) as the present state of our knowledge permits.

It is obvious that much of what has been said under this article is more applicable to land than to sea observations; but the letter of the Board of Trade, to which this is a reply, requests that both should be contemplated.

Temperature of the Sea, and Investigations regarding Currents.—It is unnecessary to dwell on the practical importance to *navigation* of a correct knowledge of the currents of the ocean; their direction, extent, velocity, and the temperature of the surface water relatively to the ordinary ocean temperature in the same latitude;

together with the variations in all these respects which currents experience in different parts of the year and in different parts of their course. As the information on these points, which may be expected to follow from the measures adopted by the Board of Trade, must necessarily depend in great degree on the *intelligence*, as well as the *interest* taken in them by the observers, it is desirable that the instructions to be supplied with the meteorological instruments should contain a brief summary of what is already known in regard to the principal oceanic currents; accompanied by charts on which their supposed limits in different seasons, and the variations in those limits which may have been observed in particular years, may be indicated, with notices of the particularities of the temperature of the surface water by which the presence of the current may be recognized. Forms will also be required for use in such localities, in which the surface temperatures may be recorded at hourly or half-hourly intervals, with the corresponding geographical positions of the ship, as they may be best inferred from observation and reckoning. For such localities also it will be necessary that the tables, into which the observations of different ships at different seasons are collected, should have their bounding lines of latitude and longitude brought nearer together than may be required for the ocean at large.

In looking forward to the results which are likely to be obtained by the contemplated marine observations, it is reasonable that those which may bear practically on the interests of navigation should occupy the first place; but, on the other hand, it would not be easy to over-estimate the advantages to physical geography, of general tables of the surface temperature of the ocean in the different months of the year, exhibiting, as they would do, its normal and its abnormal states, the mean temperature of the different parallels, and the deviations therefrom, whether permanent, periodical, or occasional. The knowledge which such tables would convey is essentially required for the study of climatology *as a science.*

The degree in which climatic variations extending over large portions of the earth's surface may be influenced by the variable phenomena of oceanic currents in different years, may perhaps be illustrated by circumstances of known occurrence in the vicinity of our own coasts. The admirable researches of Major Rennell have shown that in ordinary years, the warm water of the great current known by the name of the Gulf Stream, is not found to the east of the meridian of the Azores; the sea being of ordinary ocean temperature for its latitude at all seasons and in every direction, in the great space comprised between the Azores, and the coasts of Europe and North Africa; but Major Rennell has also shown that on two occasions, viz: in 1776 and in 1821–1822, the warm water by which the Gulf Stream is characterized throughout its whole course (*being several degrees* above the ordinary ocean temperature in the same latitude), was found to extend across this great expanse of ocean, and in 1776 (in particular) was traced (by Dr. Franklin) quite home to the coast of Europe. The presence of a body of unusually heated water, extending for several hundred miles both in latitude and in longitude, and continuing for several weeks, at a season of the year when the prevailing winds blow from that quarter on the coasts of England and France, can scarcely be imagined to be without a considerable influence on the relations of temperature and moisture in those countries. In accordance with this supposition, we find in the meteorological journals of the more recent period (which are more easily accessible), that the state of the weather in

November and December, 1821, and January, 1822, was so unusual in the southern parts of Great Britain and in France, as to have excited general observation; we find it characterized as "most extraordinarily hot, damp, stormy and oppressive," that "the gales from the W. and S. W. were almost without intermission," "the fall of rain was excessive" and "the barometer lower than it had ever been known for 35 years before."

There can be little doubt that Major Rennell was right in ascribing the unusual extension of the Gulf Stream in particular years to its greater initial velocity, occasioned by a more than ordinary difference in the levels of the Gulf of Mexico and of the Atlantic in the preceding summer. An unusual height of the Gulf of Mexico at the head of the stream, or an unusual velocity of the stream at its outset in the Strait of Florida, are facts which may admit of being recognized by properly directed attention; and as these must precede, by many weeks, the arrival of the warm water of the stream at above 3000 miles distance from its outset, and the climatic effects thence resulting, it might be possible to anticipate the occurrence of such unusual seasons upon our coasts.

Much, indeed, may undoubtedly be done towards the increase of our partial acquaintance with the phenomena of the Gulf Stream, and of its counter currents, by the collection and co-ordination of observations made by casual passages of ships in different years and different seasons across different parts of its course; but for that full and complete knowledge of all its particulars, which should meet the maritime and scientific requirements of the period in which we live, we must await the disposition of Government to accede to the recommendation so frequently made to them by the most eminent hydrographical authorities, of a specific survey of the stream by vessels employed for that special service. What has been recently accomplished by the Government of the United States in this respect, shows both the importance of the inquiry, and the great extent of the research; and lends great weight to the proposition which has been made to Her Majesty's Government on the part of the United States, for a joint survey of the whole stream by vessels of the two countries. The establishment of an office under the Board of Trade, specially charged with the reduction and co-ordination of such data, may materially facilitate such an undertaking.

Storms or Gales.—It is much to be desired, both for the purposes of navigation and for those of general science, that the captains of Her Majesty's ships, and masters of merchant vessels, should be correctly and thoroughly instructed in the methods of distinguishing *in all cases* between the rotatory storms or gales, which are properly called *cyclones*, and gales of a more ordinary character, but which are frequently accompanied by a veering of the wind, which, under certain circumstances, might easily be confounded with the phenomena of cyclones, though due to a very different cause. It is recommended, therefore, that the instructions proposed to be given to ships supplied with meteorological instruments, should contain clear and simple directions for distinguishing *in all cases*, and *under all circumstances*, between these two kinds of storms; and that the forms to be issued for recording the meteorological phenomena during great atmospheric disturbances should comprehend a notice of all the particulars which are required for forming a correct judgment in this respect.

Thunder-storms.—It is known that in the high latitudes of the northern and southern hemispheres, thunder-storms are almost wholly unknown; and it is believed that they are of very rare occurrence over the ocean in the middle latitudes, when distant from continents. By a suitable classification and arrangement of the documents which will be henceforward received by the Board of Trade, statistical tables may in process of time be formed, showing the comparative frequency of these phenomena in different parts of the ocean, and in different months of the year.

It is known that there are localities on the globe where, during certain months of the year, thunder-storms may be considered as a periodical phenomenon of daily occurrence. In the Port Royal Mountains in Jamaica, for example, thunder-storms are said to take place *daily*, about the hour of noon, from the middle of November to the middle of April. It is much to be desired that a full and precise account of such thunder-storms, and of the circumstances in which they appear to originate, should be obtained.

In recording the phenomena of thunder and lightning, it is desirable to state the duration of the interval between the flashes of lightning and the thunder which follows. This may be done by means of a seconds-hand watch, by which the time of the apparition of the flash, and of the commencement (and of the conclusion also) of the thunder may be noted. The interval between the flash, and the commencement of the thunder, has been known to vary, in different cases, from less than a single second to between 40 and 50 seconds, and even, on very rare occasions, to exceed 50 seconds. The two forms of ordinary lightning, viz: zigzag (or forked) lightning, and sheet lightning, should always be distinguished apart; and particular attention should be given both to the observation and to the record, in the rare cases when zigzag lightning either bifurcates, or returns upwards. A special notice should not fail to be made when thunder and lightning, or either separately, occur in a perfectly cloudless sky. When globular lightning (balls of fire) are seen, a particular record should be made of all the attendant circumstances. These phenomena are known to be of the nature of lightning, from the injury they have occasioned in ships and buildings that have been struck by them; but they differ from ordinary lightning not only by their globular shape, but by the length of time they continue visible, and by their slow motion. They are said to occur sometimes without the usual accompaniments of a storm, and even with a perfectly serene sky. Conductors are now so universally employed in ships, that it may seem almost superfluous to remark that, should a ship be struck by lightning, the most circumstantial account will be desirable of the course which the lightning took, and of the injuries it occasioned; or to remind the seaman that it is always prudent, after such an accident has befallen a ship, to distrust her compasses until it has been ascertained that their direction has not been altered. Accidents occurring *on land* from lightning will, of course, receive the fullest attention from meteorologists who may be within convenient distance of the spot.

Auroras and Falling Stars.—Auroras are of such rare occurrence in seas frequented by ships engaged in commerce, that it may seem superfluous to give any particular directions for their observation *at sea;* and land observatories are already abundantly furnished with such. It is, of course, desirable that the

meteorological reports received from ships should always contain a notice of the time and place where auroras may be seen, and of any remarkable features that may attract attention.

The letter from Professor Heis, which is one of the foreign communications annexed, indicates the principal points to be attended to in the instructions which it may be desirable to draw up for the observation of "Falling Stars." For directions concerning halos and parhelia, a paper by Monsieur Bravais, in the *Annuaire Météorologique de la France* for 1851, contains suggestions which will be found of much value.

Charts of the Magnetic Variation.—Although the variation of the compass does not belong in strictness to the domain of meteorology, it has been included, with great propriety, amongst the subjects treated of by the Brussels Conference, and should not therefore be omitted here. It is scarcely necessary to remark, that whatever may have been the practice in times past, when the phenomena of the earth's magnetism were less understood than at present, it should in future be regarded as indispensable, that variation charts should always be constructed for a *particular epoch*, and that *all parts* of the chart should show *the variation corresponding to the epoch for which it is constructed.* Such charts should also have, either engraved on the face or attached in some convenient manner, a table, showing the approximate annual rate of the secular change of the variation in the different latitudes and longitudes comprised: so that, by means of this table, the variation taken from the chart for any particular latitude and longitude may be corrected to the year for which it is required, if that should happen to be different from the epoch for which the chart is constructed.

A valuable service would be rendered to this very important branch of hydrography if, under the authority of the new department of the Board of Trade, variation charts for the North and South Atlantic Oceans, for the North and South Pacific Oceans, for the Indian Ocean, and for any other localities in which the requirements of navigation might call for them, were published at *stated intervals*, corrected for the secular change that had taken place since the preceding publication. Materials would be furnished for this purpose by the observations which are now intended to be made, supposing them to be collected and suitably arranged with proper references to date and to geographical position, and to the original reports in which the results and the data on which they were founded were communicated. By means of these observations, the tables of approximate correction for secular change might also be altered from time to time as occasion should require, since the rate of secular change itself is not constant.

All observed variations, communicated or employed as data upon which variation charts may be either constructed or corrected, should be accompanied by other observational data (the nature of which ought now to be well understood), for correcting the observed variation for the error of the compass occasioned by the ship's iron. It also is strongly recommended that no observations be received as data for the formation or correction of variation charts, but such as are accompanied by a detailed statement of the principal elements both of observation and of calculation. Proper forms should be supplied for this purpose; or, what is still better, books of blank forms may be supplied, in which the observations

themselves may be entered, and the calculation performed by which the results are obtained. Such books of blank forms would be found extremely useful, both for the variation of the needle and for the chronometrical longitude (as well as for lunar observations, if the practice of lunar observations be not, as there is too much reason to fear it is, almost wholly discontinued). By preparing and issuing books of blank forms suitable for these purposes, and by requesting their return in accompaniment with the other reports to be transmitted to the Board of Trade at the conclusion of a voyage, the groundwork would be laid for the attainment of greatly improved habits of accuracy in practical navigation in the British mercantile marine.

The President and Council are aware that they have not exhausted the subject of this reply in what they have thus directed me to address to you; but they think that perhaps they have noticed as many points as may be desirable for *present* attention; and they desire me to add, that they will be at all times ready to resume the consideration if required, and to supply any further suggestions which may appear likely to be useful.

I have the honor to be, sir,

Your obedient servant,

W. SHARPEY,

Sec. R. S.

To the Secretary of the Lords of the Committee of Privy Council for Trade.

The correspondence is instructive as well as important, and I have quoted with it a letter of my own in reply, not because it deserves to be classed with this correspondence, but because it also belongs to the history of the work already in hand.

The state of affairs in Europe makes the present moment an inauspicious one for the further consideration of this subject by that enlightened government just now. But as soon as the war will permit ministers and officials to turn their attention to the peaceful affairs of science, it is hoped that this question of a meteorological conference for the land will be taken up and carried out.

The French Academy of Sciences has always favored the plan; Kupffer, of Russia, is one of its earliest projectors and advocates. That admirable man of science, M. Quetelet, the President of the Brussels Conference, is most earnest in favor of it; and M. Dové, one of the great meteorologists of the Continent, went from Berlin to Liverpool last year, to attend the meeting of the British Association, and to advocate in person, the measure, with other friends there. Kamtz of Dorpat, Heis of Münster, Kreil of Vienna, Lamont of Bavaria, and Secchi of Rome, are also understood to be in favor of it. Spain, Naples, and the Holy See have already assented to the proposition. The governments of South America, the authorities of India, Portugal, Holland, Denmark, Norway and Sweden, have also either directly signified their readiness to go into such a conference, or, by their enlightened and liberal course, given us reason to infer that, when properly solicited, they would not be found in opposition to any such plan for advancing the cause of science, and the good of the human family.

EXPLANATION OF THE PLATES.

PLATE I. is intended to illustrate the Pilot Charts, and is a section taken from one of the manuscripts of that series. It illustrates the method for co-ordinating for these charts the winds as reported in the abstract logs. For this purpose, the ocean is divided into convenient sections, usually five degrees of latitude by five degrees of longitude. These parallelograms are then subdivided into a system of engraved squares; the months of the year being the ordinates, and the points of the compass being the abscissæ. As the wind is reported by a vessel that passes through any part of the parallelogram, so it is assumed to have been at that time all over the parallelogram. From such investigations as this the Pilot Charts are constructed. (*Vide* p. 226, *et seq.*)

Plate II. is a diagram of the winds, and is intended especially to illustrate the circulation of the atmosphere, as described in Chapter I. p. 14. The arrows and bands within the circumference of the circle are intended to show the calm belts, and prevailing direction of the wind on each side of those belts. The arrows exterior to the periphery of the circle—which is a section of the earth supposed to be made in the plane of the meridian—are intended to show the direction of the upper strata of winds in the general system of atmospherical circulation; and also to illustrate how the air, brought by each stratum to the calm belts, there ascends, or descends, as the case may be; and then, continuing to flow on, how it crosses over in the direction in which it was travelling when it arrived at the calm zone (*Vide* p. 17.)

Plate III. is a sample of the Storm and Rain Charts. It is an extract from one of them. (*Vide* p. 250.)

Plate IV. is intended to demonstrate how the winds may become geological agents. It shows where the winds that blow, in the general system of atmospherical circulation, over the deserts and thirsty lands in Asia and Africa (where the annual amount of precipitation is small), are supposed to get their vapors from; where, as surface winds, they are supposed to condense portions of it; and whither they are supposed to transport the residue thereof through the upper regions, retaining it until they again become surface winds. To make clear the course of such vapor-bearing winds, let A be a breadth or *swarth* of winds in the northeast trades; B, the same wind as the upper and counter-current to the southeast trades; and C, the same wind after it has descended in the calm belt of Capricorn, and come out on the polar side thereof, as the rain winds and prevailing northwest winds of the extra-tropical regions of the southern hemisphere.

When in the northeast trades, it was the evaporating wind; as the northeast trade-wind, it swept over a great waste of waters lying between the tropic of Cancer and the equator.

Meeting no land in this long oblique track, over the tepid waters of a tropical sea, it would, if such were its route, arrive somewhere about the meridian of 140° or 150° west, at the belt of equatorial calms, which always divides the northeast from the southeast trade-winds. Here, depositing a portion of its vapor as it ascends, it would, with the residuum, take, on account of diurnal rotation, a course in the upper region of the atmosphere to the southeast as far as the calms of Capricorn. Here, according to the hypothesis which this plate is used to illustrate, it descends and continues on toward the coast of South America, in the same direction, appearing now as the prevailing north-west wind of the extra-tropical regions of the southern hemisphere. Travelling on the surface from warmer to colder regions, it must, in this part of its circuit, precipitate more than it evaporates.

Now it is a coincidence; at *least*, that this is the route by which, on account of the land in the northern hemisphere, the northeast trade-winds have the fairest sweep over that ocean; that this is the route by which they are longest in contact with an evaporating surface; that this is the route by which all circumstances are most favorable to complete saturation; and that this is the route by which such winds can pass over into the southern hemisphere most heavily laden with vapors for the extra-tropical regions of that half of the globe; and, moreover, that this is the supposed route which the northeast trade-winds of the Pacific do take to reach the equator, and to pass from it.

I have also marked on this plate the supposed track of the sea-dust, showing where it was taken up in South America, as at P, P, and where it was found, as at S, S; the part of the line in dots denoting where it was in the upper current, and the unbroken line where it was wafted by a surface current; also, on the same plate is designated the part of the South Pacific in which the vapor-springs for the Mississippi rains are supposed to be. The hands (☞) point out the direction of the vapor-bearing wind. When the shading is light, the vapor is supposed to be carried by an upper current. (See p. 50, *et seq.*)

Plate V. is explanatory of the Pilot Charts as they appear when published. It is a sample of them, and is fully explained at p. 228.

Plate VI. illustrates the manner in which the calculated routes to and from Europe for each month (pp. 293, 304), and the calculated routes to Rio (pp. 330, 425) are got out. The method of computing these routes, and the explanation of the plate, are given at pp. 229–30.

Plates VII. and VIII. are drawings of Brooke's Deep-Sea Sounding Apparatus, which is fully described at p. 129.

Plate IX. illustrates the method of co-ordinating for the Whale Charts, in order to show how many days in each month for each district have been spent by vessels in search of whales, and on how many of these days whales have been seen. It is fully explained at p. 256.

Plate X. is the type of a class of gales of wind. It was suggested by Lieut. Porter, and exhibits the actual path of a storm, which is a type of the West India hurricanes. Mr. Redfield, Col. Reid, and others, have traced out the paths of a number of such storms. All storms of this class appear to make for the Gulf Stream; after reaching it, they turn about and follow it in their course.

Mr. Piddington, of Calcutta, has made the East India hurricanes, which are similar to these, the object of special, patient, and laborious investigation. He calls them *cyclones*, and has elicited much valuable information concerning them, which may be found embraced in his *Sailor's Hornbook*, *Conversations about Hurricanes*, and numerous papers published from time to time in the *Journal of the Asiatic Society*. (*Vide* pp. 115, 287.)

Plates XI. and XII. afford diagrams of the steam lanes across the Atlantic (p. 308), and of the computed tracks or routes tabulated at pp. 293, 304, and pp. 330, 342, 365, 376, 389, 397, 403, 409, 418, and 425.

Plate XIII. is a sample of the Whale Charts that are constructed after the materials for it have been co-ordinated in the manner of Plate IX. It is fully explained at p. 286.

Plates XIV. and XV. are orographic of the Atlantic Ocean, and exhibit completely the present state of our knowledge with regard to the elevations and depressions in the bed of that sea; Plate XV. exhibiting a vertical section of the Atlantic, and showing the contrasts of its bottom with the sea-level, in a line from Mexico across Yucatan, Cuba, San Domingo, and the Cape de Verde Islands, to the coast of Africa, which line is marked A on Plate XIV. The first and darkest shade of stippling—Plate XIV.—going from the shore, represents all depths of less than 1,000 fathoms; the next, of more than 1,000, but less than 2,000; the next, of more than 2,000, but less than 3,000, and so on, each shade representing 1,000 fathoms. The unshaded place south of Newfoundland is, probably, the deepest part of the North Atlantic. (*Vide* pp. 125, 130, 148, 153.)

Plate XVI. shows the forms of clouds, and is intended to enable navigators to fill up properly the column in the abstract log, headed *Forms and Direction of Clouds*. They are named according to Howard. (*Vide* p. 197.)

Plate XVII. illustrates many phenomena connected with the Gulf Stream, and the general movement of the

water in the North Atlantic Ocean. It shows the mean place of the Sargasso Sea, also the channel way of the Gulf Stream. The diagram A shows a thermometrical profile presented by cross sections of the Gulf Stream, according to observations made by the hydrographical parties of the United States Coast Survey. The elements for this diagram were kindly furnished me by the superintendent of that work. They are from a paper on the Gulf Stream, read by him before the American Association for the Advancement of Science, at its meeting in Washington, 1854. Imagine a vessel to sail from the Capes of Virginia straight out to sea, crossing the Gulf Stream at right angles, and taking the temperature of its waters, both at the surface and at various depths. This diagram shows the elevation and depression of the thermometer across this section, as they were actually observed by such a vessel.

The black lines x, y, z, in the Gulf Stream, show the course which those threads of warm waters take. The lines a, b, show the route that the unfortunate steamer San Francisco would, according to calculation, take after her terrible disaster in December, 1853. (*Vide* pp. 88, 97, 101, 108.)

Plate XVIII. is intended simply to show, in a very general way, the prevailing *quarter* of the winds, the calm belts, and some of the principal routes, as derived from the series of investigations illustrated on Plate VI. When the cross lines representing the yards are oblique to the keels of the vessels on the plate, they indicate that the winds are, for the most part, ahead; when perpendicular or square, that the winds are, for the most part, fair. The figures on or near the diagrams representing the vessels, show the average length of the passage in days.

The arrows denote the prevailing quarter of the wind; they are supposed to fly *with* it; so that the wind is going as the arrows point. The half-bearded and half-feathered arrows represent monsoons; and the stippled or shaded belts, the calm zones.

In the regions on the polar side of the calms of Capricorn and of Cancer, where the arrows are flying both from the northwest and the southwest, the idea intended to be conveyed is, that the prevailing direction of the wind is between the northwest and the southwest, and that their frequency is from these two quarters, in proportion to the number of arrows. (*Vide* pp. 37, 38, 39.)

Plate XIX. is a diagram illustrative of the general circulation of the ocean as induced chiefly by changes of temperature as well as differences of temperature; it also shows the most favorite places of resort to the whale. Just west of South America, there is a large region of the Pacific which seems to be avoided by the whales as well as by other creatures. Seamen have described it to me as the most desolate and lifeless part of the ocean through which they have ever passed. Even the birds, the cape pigeons and stormy petrels, and others, which have followed them for many days, disappear here, and almost all signs of animation cease. It is traversed by the homeward bound vessels from Australia, including those that go to Peru for guano. Captain Leighton, of the English ship Marion, in an abstract log kept by him, on a voyage, in 1855, from Australia to Callao, and returned to this office, thus speaks of it:—

"Between the positions of 44° and 39° S. and 122° and 88° W. appeared to me remarkably desolate. There was nothing seen in the water and the air, which, in the great Southern Ocean, are so generally alive with birds; we were almost deserted. Those desirable companions, the cape pigeons, were never seen, and very rarely the whale bird; but the universal petrel was never seen, and they had stuck to us constantly even through the tropics. Two or three albatrosses, or the bird like and next in size to it, were all that we saw."

The attention of navigators is invited to this place and circumstance, for I should be glad to have more light upon this subject.

Plate XX.—Isotherms for March and September in North and South Atlantic. It is very instructive, and shows at a glance not only that there is a marked difference of the climates of countries situated at equal distances from the equator north and south, but the cause of that difference. The isotherms of 50° and 60° run nearly east and west across the South Atlantic; but in the North, they run northeast with the Gulf Stream. (*Vide* pp. 169, 248.)

Plate XXI. has for its object to present the average ratio of fogs, calms, rains, and gales, both fair and

adverse, that prevail along each section of each steam lane, p. 308. These lanes run nearly east and west, they are exhibited in the Plate. For further description of it see p. 314.
divided into lengths or sections of 5°, and the conditions of the weather for each month and every section are

Plate XXII. illustrates the tidal waves of the atmosphere within the tropics, and shows their rise and fall by the barometer at Calcutta, Madras, and Bombay, in comparison with the daily record of the needle at Hobarton and St. Helena. The horizontal lines count for the barometric scale, parts of inches; for declination, angular spaces in minutes and seconds; for inclination, parts of the force. The arrows show what motions and ends of the needle are represented when the curves move up or down. (*Vide* p. 654.)

Plate XXIII.—Illustration of the landmarks under foot, which mark the way from sea to Sandy Hook, is fully explained at page 849.

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* See Introduction.

* Vide p. 856.

☞ THE ATTENTION OF OFFICERS OF THE NAVY IS ESPECIALLY REQUESTED TO PP. 124, 125, 848, AND 864.

THE WIND AND CURRENT CHARTS.

THE great demand among seamen for these Charts, and the interest they have excited among philosophers, make it proper to give some account of their origin and progress. We will also take a survey of the field of research from which these Charts have been gathered, and show the steps that have been taken to occupy it with laborers.

This seems to be the more proper, since I hope, by giving such an account, to impress with the importance of the undertaking, seafaring men, and others who have it in their power to facilitate the work.

"In the present condition of the surface of our planet," says Baron Humboldt, the most celebrated philosopher of the age, "the area of the solid is to that of the fluid parts as 1 to $2\frac{4}{5}$ (according to Rigaud, as 100 to 270). The islands form scarcely $\frac{1}{23}$ of the continental masses, which are so unequally divided that they consist of three times more land in the northern than in the southern hemisphere; the latter being, therefore, pre-eminently oceanic. From 40° south latitude, to the antarctic pole, the Earth is almost entirely covered with water. The fluid element predominates in like manner between the eastern shores of the old, and the western shores of the new continent, being only interspersed with some few insular groups. The learned hydrographer, Fleurieu, has very justly named this vast oceanic basin which, under the tropics, extends over 145° of longitude, the Great Ocean, in contradistinction to all other seas. The southern and western hemispheres (reckoning the latter from the meridian of Teneriffe) are, therefore, more rich in water than any other region of the whole earth.

"These are the main points involved in the consideration of the relative quantity of land and sea, a relation which exercises so important an influence on the distribution of temperature, the variation in atmospheric pressure, the direction of the winds, and the quantity of moisture contained in the air, with which the development of vegetation is so essentially connected. When we consider that nearly three-fourths of the upper surface of our planet are covered with water, we shall be less surprised at the imperfect condition of meteorology before the beginning of the present century; since it is only during the subsequent period that numerous accurate observations on the temperature of the sea at different latitudes, and at different seasons, have been made and numerically compared together."—*Humboldt's Cosmos.*

"I beg you to express to Lieut. Maury, the author of the beautiful *Charts of the Winds and Currents*, prepared with so much care and profound learning, my hearty gratitude and esteem. It is a great undertaking, equally important to the practical navigator and for the advance of meteorology in general. It has been viewed in this light in Germany by all persons who have a taste for physical geography. In

an analogous way, my theory of isothermal lines (equal annual temperature) has for the first time become really fruitful, since Dove has taught us the isotherms of the several months chiefly on the land; since two-thirds of the atmosphere rest upon the sea, Maury's work is so much the more welcome and valuable, because it includes at the same time the oceanic currents, the course of the winds, and the temperature. How remarkable are the relations of temperatures, in Sheet No. 2, South Atlantic, east and west of longitude 40; how much would this department of meteorology gain if it were filled up according to Maury's proposition to Commodore Lewis Warrington concerning the Abstract Log. The shortening of the voyage from the United States to the equator, is a beautiful result of this undertaking. The bountiful manner in which these Charts are distributed raises our expectations still higher."—*Baron Von Humboldt to Dr. Flügel, U. S. Consul, Leipsic.*

It is not for the benefit of navigation alone, that seamen are invited to make observations, and collect materials for the Wind and Current Charts; other great interests besides those of commerce, have their origin in the ocean, or the air; and these interests are doubtless to be advanced as we gain knowledge of the laws which govern the circulation of the atmosphere, and regulate the movements of the aqueous portions of our planet.

The agricultural capacities of any place, are as dependent upon the hygrometrical, as they are upon the thermometrical condition of the atmosphere. This is obvious, and easily illustrated.

Each kind of plant requires, for its most perfect development, a certain degree of moisture, and the winds which bring that moisture can get it only from the sea, or other evaporating surfaces.

It is often argued, because wine, olives, or other products are raised on a given parallel of latitude, that they should be produced upon the same parallel wherever the proper soil is to be found; but the route which the winds from the ocean take in reaching the supposed parallel, should not be overlooked.

Virginia and California are between the same parallels, yet how different their agricultural resources, the character and flavor of their fruits! all owing, not so much to difference of soil, as to the way the winds blow, the quantity of moisture they bring, the proportion of clouds and sunshine allotted to each place.

The system of researches embraced by the Wind and Current Charts, therefore, concern the philosopher and the husbandman, as well as the mariner, the merchant, and the statesman.

A wider field, or one more rich with promise, has never engaged the attention of the philosopher. Though so often frequented, it has never been explored, if by exploration we mean collecting and grouping, with the view of tracing, in the true spirit of inductive philosophy, fact into effect, and effect up to cause, all those phenomena which mariners observe in connection with the ocean and the air above it.

The mariner, therefore, when he is making and recording out at sea, an observation in connection with these Charts, should always remember that upon the fidelity of the observation and the record, depends the ability of the Philosopher to read aright the workings of those physical agents that are employed to produce, in the grand scheme of creation, those results which are the subjects of his observations.

The wind and rain; the vapor and the cloud; the tide, the current, the saltness, depth, warmth and

color of the sea; the shade of the sky; the temperature of the air; the tint and form of the clouds; the height of the tree on the shore, the size of its leaves, the brilliancy of the flowers;—each and all may be regarded as the exponent of certain physical combinations, and, therefore, as the expression in which Nature chooses to announce her meaning, or the language in which she writes the operation of her laws. To understand that language, and to interpret aright those laws, is the object of the undertaking which those who co-operate with me have in hand. To those who tread the walks of inductive philosophy, no fact gathered in such a field as this can come amiss; for, in the handbook of Nature, every such fact is a syllable; and it is by patiently collecting fact after fact, and by joining syllable after syllable, that we may finally hope to read with understanding in the great volume which, in sea and air, is continually spread out before sailor and philosopher.

Dr. Buist, a learned and eminent *savant* of India, has drawn a beautiful picture of our field of research.

In the report on the affairs of the "Bombay Geographical Society," presented by the Secretary at the annual meeting, in May, 1850, he remarks: "The Assistant Secretary of your Society,* Mr. Macfarlane, has made considerable progress in the construction of Wind and Current Charts, founded on the information supplied by ships' logs and on the principle of Lieutenant Maury. It is more than probable that, besides the currents occasioned by the trade-winds, monsoons, and set of the tides, we have a group of movements intermingled with those dependent mainly on evaporation. When it is remembered that on the western shore of the Arabian Sea, including in this the Red Sea and Persian Gulf, from the line northward, we have an expanse of coast of not less than 6,000 miles, and a stretch of country of probably not less than 100 miles inland from this, where the average fall of rain does not amount to four inches annually, where not one-half of this ever reaches the sea, and where, to the best of our knowledge, the evaporation over the ocean averages at least a quarter of an inch daily, all the year round, or close on eight feet annually, some idea of the enormous abstraction of water in the shape of vapor may be formed. On the assumption that this extends no further, on an average, than 50 miles out to sea, we shall have no less than 39 cubic miles of water raised annually in vapor from the northern and northwestern side of the basin, which must be supplied from the open ocean on the south or the rain on the east. The fall of rains on the western side of the ridge of the mountain chain, from Cape Comorin to Cutch, averages pretty nearly 180 inches annually, and of this, at least 160 is carried off to the sea; that on the Concan to 70 inches, of which probably 30 flow off to the ocean; or betwixt the two, over an area of twenty miles from the sea-shore to the Ghauts, and about 1,200 miles from the north to the south, or an area of 24,000 square miles in all, we shall probably have an average discharge of nine feet, or close on forty cubic miles of water—an amount sufficient, were it not diffused, to raise the sea on our shores three feet high, over an area of 72,000 square miles.

"The waters of the ocean cover nearly three-fourths of the surface of the globe; and of the thirty-eight millions of miles of dry land in existence, twenty-eight millions belong to the northern hemisphere.

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* *Vide* Transactions Bombay Geographical Society, Vol. IX. 1850, p. 80, *et seq.*

The mean depth of the ocean is somewhere about four miles—the greatest depth the sounding-line has ever reached is five and a quarter miles.* The mean elevation of the land, again, is about one thousand feet—the highest point known to us, is nearly as much above the level of the sea, as the great depth that has been measured is below it. The atmosphere, again, surrounds the earth like a vast envelop; its depth, by reason of the tenuity attained by it, as the superincumbent pressure is withdrawn, is unknown to us—but is guessed at somewhere betwixt fifty and five hundred miles. Its weight, and its constituent elements, have been determined with the utmost accuracy. The weight of the mass is equal to that of a solid globe of lead sixty miles in diameter. Its principal elements are oxygen and nitrogen gases, with a vast quantity of water suspended in them in the shape of vapor, and commingled with these a quantity of carbon in the shape of fixed air, equal to restore from its mass many fold the coal that now exists in the world. In common with all substances, the ocean and the air are increased in bulk, and consequently diminished in weight, by heat; like all fluids, they are mobile, tending to extend themselves equally in all directions, and to fill up depressions in whatever vacant space will admit them; hence, in these respects, the resemblance betwixt their movements. Water is not compressible or elastic, and it may be solidified into ice or vaporized into steam; the air is elastic—it may be condensed to any extent by pressure, or expanded to an indefinite degree of tenuity by pressure being removed from it; it is not liable to undergo any change in its constitution beyond these, by any of the ordinary influences by which it is affected. These facts are few and simple enough—let us see what results arise from them. As the constant exposure of the equatorial regions of the Earth to the Sun must necessarily here engender a vast amount of heat—and as his absence from the polar regions must in like manner promote an infinite accumulation of cold—to fit the entire Earth for a habitation to similar races of beings, a constant interchange and communion, betwixt the heat of the one and the cold of the other, must be carried on. The ease and simplicity with which this is effected, surpass all description. The air, heated near the equator by the overpowering influences of the Sun, is expanded and lightened; it ascends into upper space, leaving a partial vacuum at the surface to be supplied from the regions adjoining. Two currents from the poles towards the equator are thus established at the surface, while the sublimated air, diffusing itself by its mobility, flows in the upper regions of space from the equator towards the poles. Two vast whirlpools are thus established, constantly carrying away the heat from the torrid towards the icy regions, and these becoming cold by contact with the ice, carry back their gelid freight to refresh the torrid zone. Did the Earth, as was long believed, stand still while the sun circled around it, we should have had two sets of meridional currents blowing at the surface of the Earth, directly from north and south, towards the equator, in the upper regions flowing back again to the place whence they came. On the other hand, were the heating and cooling influences just referred to, to cease, and the Earth to fail in impressing its own motion on the atmosphere, we should have a furious hurricane rushing round the globe, at the rate

* Lieutenant Walsh, U. S. N., while co-operating, in the U. S. schooner Taney, with me, in these researches, reports a sounding in the North Atlantic of 6½ miles (5,700 fathoms), without bottom.—M.

of 1,000 miles an hour—tornadoes of ten times the speed of the most violent now known to us, sweeping everything before them. A combination of the two influences, modified by the friction of the Earth, which tends to draw the air after it, gives us the trade-winds, which sweep round the equatorial region of the globe unceasingly, at the speed of from ten to twenty miles an hour; the aerial current, quitting the polar regions with the comparatively tardy speed, from east to west, imposed on it by the velocity due to the 70th parallel, is left behind the globe, and deflected into an oblique current, as it advances southward, till, meeting the current from the opposite pole near the equator, the two combine and form the vast stream known as the trades—separated in two, where the air ascends by the belt of variable winds and rains. Impressed with the motion of the air, constantly sweeping its surface in one direction, and obeying the same laws of motion, the great sea itself would be excited into currents similar to those of the air, were it not walled in by continents, and subjected to other control. As it is, there are constant currents flowing from the torrid towards the frigid zone, to supply the vast mass of vapor there drained off; while other whirlpools and currents, such as the gigantic Gulf Stream, come to perform their part in the same stupendous drama. The current just named, sweeps across the Atlantic, to the Gulf of Mexico, and by the Straits of the Bahamas. Here it turns to the eastward, again, travelling along the coast of America at the rate of from forty to a hundred miles a day. It now stands once more across the Atlantic, and divides itself into two branches; one finds its way into the northern sea, warming the adjoining waters as it advances, and turning back, most likely to form a second great whirlpool, rejoining the original stream near Newfoundland. The main branch seeks the northern shores of Europe, and, sweeping along the coast of Spain and Portugal, travels southward by the Azores to rejoin the main whirlpool. The waters of this vast ocean river are, to the north of the tropic, greatly warmer than those around; the climate of every country it approaches is improved by it, and the Laplander is enabled by its means to live and cultivate his barley, in a latitude which, everywhere else throughout the world, is condemned to perpetual sterility. But there are other laws which the great sea obeys, which peculiarly adapt it as the vehicle of interchange of heat and cold betwixt those regions where either exists in excess. Water, which contracts regularly from the boiling point downwards, at a temperature of 40° has reached its maximum of density, and thence begins to grow lighter and expand. But for this most beneficent provision, the vast recesses of the Northern Ocean would be continually occupied with a fluid at the freezing point, which the least access of cold would convert into one solid mass of ice. The non-conducting power of water, which at present acts so valuable a part in the general economy, so far from being a blessing would be a curse. No warmth could ever penetrate to thaw the foundations of the frozen mass—no water find its way to float it from its foundations; so that, like the everlasting hills themselves, rooted immovable in its place, every year adding to its mass, the solid structure would continually advance to the southward, hermetically sealing the polar ocean, thus condemned to utter desolation, and encroaching on the North Sea itself. Under existing circumstances, so soon as water is cooled down to 40°, it sinks to the bottom, and, still eight degrees warmer than ice, it attacks the basis and saps the foundations of the icebergs—themselves gigantic glaciers, which have fallen from the mountains into the sea, or which have grown to their present

size in the shelter of bays and estuaries, and by accumulations from above. Once forced from their anchorage, the first storm that arises drifts them to sea, where the beautiful law which renders ice lighter than the warmest water enables it to float—and drifts southward a vast magazine of cold to cool the tepid water which bears it along—the evaporation at the equator causing a deficit, the melting and accumulation of the ice in the frigid zone giving rise to an excess of accumulation, which tends, along with the action of the air and other causes, to institute and maintain the transporting current. These stupendous masses, which have been seen at sea in the form of church spires, and gothic towers, and minarets, rising to the height of from 300 to 600 feet, and extending over an area of not less than six square miles, the masses above water being only one-tenth of the whole, are often to be found within the tropics. A striking fact, dependent on this general law, has just been brought to light; there is a line extending from pole to pole, at or under the surface of the ocean, where an invariable temperature of 39.5 is maintained. The depth of this varies with the latitude; at the equator it is 7,200 feet—at latitude 56° it ascends to the surface, the temperature of the sea being here uniform throughout. North and south of this the cold water is uppermost, and at latitude 70° the line of uniform temperature descends to 4,500. But these, though amongst the most regular and magnificent, are but a small number of the contrivances by which the vast and beneficent ends of nature are brought about. Ascent from the surface of the Earth produces the same change, in point of climate, as an approach to the poles; even under the torrid zone, mountains reach the line of perpetual congelation at nearly a third less altitude than the extreme elevation which they sometimes attain. At the poles, snow is perpetual at the ground, and at the different intervening latitudes, reaches some intermediate point of congelation, betwixt one and 20,000 feet. In America, from the line south to the tropics, as also, as there is now every reason to believe, in Africa, within similar latitudes, vast ridges of mountains, covered with perpetual snow, run northward and southward in the line of the meridian right across the path of the trade-winds. A similar ridge, though of less magnificent dimensions, traverses the peninsula of Hindoostan, increasing in altitude as it approaches the line—attaining an elevation of 8,500 feet at Dodabetta, and above 6,000 in Ceylon. The Alps in Europe, and the gigantic chain of the Himalayas in Asia, both far south in the temperate zone, stretch from east to west, and intercept the aerial current from the north. Others of lesser note, in the equatorial or meridional, or some intermediate direction, cross the paths of the atmospherical currents in every direction, imparting to them fresh supplies of cold, as they themselves obtain from them warmth in exchange; in strictness, the two operations are the same. Magnificent and stupendous as are the effects and results of the water and of air acting independently, on each other, in equalizing the temperature of the globe, they are still more so when combined. One cubic inch of water, when invested with a sufficiency of heat, will form one cubic foot of steam—the water before its evaporation, and the vapor which it forms, being exactly of the same temperature; though in reality, in the process of conversion, 1,700 degrees of heat have been absorbed or carried away from the vicinage, and rendered latent or imperceptible; this heat is returned in a sensible and perceptible form the moment the vapor is converted once more into water. The general fact is the same in the case of vapor carried off by dry air, at any temperature that may be imagined; for, down far

below the freezing point, evaporation proceeds uninterruptedly, or raised into steam by artificial means. The air, heated and dried as it sweeps over the arid surface of the soil, drinks up by day myriads of tons of moisture from the sea—as much indeed as would, were no moisture restored to it, depress its whole surface at the rate of four feet annually over the surface of the globe. The quantity of heat thus converted from a sensible or perceptible, to an insensible or latent state, is almost incredible. The action equally goes on, and with the like results, over the surface of the Earth, as over that of the sea, where there is moisture to be withdrawn. But night and the seasons of the year come around, and the surplus temperature thus withdrawn and stored away, at the time it might have proved superfluous or inconvenient, is reserved, and rendered back so soon as it is required; and the cold of night and the rigor of winter are modified by the heat given out at the point of condensation, by dew, rain, hail and snow.

"There are, however, cases in which, were the process of evaporation to go on without interruption and without limit, that order and regularity might be disturbed which is the great object of the Creator apparently for an indefinite time to maintain, and in the arrangements for equalizing temperature the equilibrium of saltness be disturbed in certain portions of the sea, and that of moisture under ground in the warmer regions of the earth. To prevent this, checks and counterpoises interpose just as their services come to be required. It could scarcely be imagined that, in such of our inland seas as were connected by a narrow strait with the ocean, and were thus cut off from free access to its waters, the supply of fresh water which pours into them from the rivers around would exactly supply the amount carried away by evaporation. Salt never rises in steam, and it is the pure element alone that is drawn off. We have in such cases as the Baltic and Black Seas an excess of supply over what is required, the surplus in the latter case flowing off through the Dardanelles, in the former through the Great and Little Belts. The vapor withdrawn from the Mediterranean exceeds by about a third the whole amount of fresh water poured into it; the difference is made up by a current through the Straits of Gibraltar in the latter; and a similar arrangement, modified by circumstances, must exist in all cases where circumstances are similar—the supply of water rushing through the strait from the open ocean being in exact proportion to the difference betwixt that provided from rain or by rivers, and that required by the afflux of vapor; seas wholly isolated, such as the Caspian and the Dead Sea, attain in course of time a state of perfect equilibrium—their surface becoming lowered in level and diminished in area, till it becomes exactly of the proper size to yield in vapor the whole waters poured in. The Dead Sea, before attaining this condition of repose, has sunk thirteen hundred feet below the Mediterranean, the Caspian about one-fourth of this. Lakes originally salt, and which to all appearance are no more than fragments severed from the sea by the earthquake or volcano, and which have no river or rain supplies whatever, in process of time dry up and become a mass of rock salt in their former basin. Such is the formation in progress in the lake near Tadjurra, nearly five hundred feet below the level of the sea, its waters having been thus much depressed by evaporation, having now almost altogether vanished, one mass of salt remaining in their room. As it is clear in a case such as that of the Mediterranean, that where salt water to a large extent was poured in

and fresh water only was drawn off, a constant concentration of brine must occur, the proposition was laid down by the most distinguished of our geologists, and long held unquestionable, that huge accumulations of salt, in masses larger than all that Cheshire contains, were being formed in its depths. The doctrine, eminently improbable in itself, is now met by the discovery of an outward under-current, in all likelihood of brine. It is matter of easy demonstration that, without some such arrangement as this, the Red Sea must long ere now have been converted into one mass of salt, its upper waters at all events being known in reality to differ at present but little in saltness from those of the Southern Ocean. The Red Sea forms an excellent illustration of all kindred cases. Here we have salt water flowing in perpetually through the Straits of Babelmandeb, to furnish the supplies for a mass of vapor calculated, were the strait shut up, to lower the whole surface of the sea eight feet annually—and even with the open strait, to add to its contents a proportionate quantity of salt. But an under-current of brine, which, from its gravity, seeks the bottom, flows out again to mingle with the waters of the great Arabian Sea, where, swept along by currents, and raised to the surface by tides and shoals, it is mingled by the waves, through the other waters, which yearly receive the enormous monsoon torrents, the Concan and the Ghaut's supply, become diluted to the proper strength of sea water, and rendered uniform in their constitution, by the agitation of the storms which then prevail. Flowing back again from the coasts of India, where they are now in excess, to those of Africa, where they suffer from perpetual drainage, the same round of operations go on continually; and the sea, with all its estuaries and its inlets, retains the same limit, and nearly the same constitution, for unnumbered ages. A like check prevents on shore the extreme heating and desiccation from which the ground would otherwise suffer. The Earth is a bad conductor of heat; the rays of the Sun which enter its surface, and raise the temperature to 100 or 150°, scarcely penetrate a foot into the ground; a few feet down, the warmth of the ground is nearly the same night and day. The moisture which is there preserved free from the influence of currents of air, is never raised into vapor; so soon as the upper stratum of earth becomes thoroughly dried, capillary action, by means of which all excess of water was withdrawn, ceases; and even under the heats of the tropics, the soil two feet down will be found, on the approach of the rains, sufficiently moist for the nourishment of plants. The splendid flowers and vigorous foliage which burst forth in May, when the parched soil would lead us to look for nothing but sterility, need in no way surprise us; fountains of water, boundless in extent and limited in depth by the thickness of the soil which contains them, have been set aside and sealed up for their use, beyond the reach of those thirsty winds or burning rays which are suffered only to carry off the water which is superfluous, and would be pernicious, removing it to other lands, where its agency is required, or treasuring it up in the crystal vault of the firmament, as the material of clouds and dew—and the source, when the fitting season comes round again, of those deluges of rain which provide for the wants of the year.

"Such are some of the examples which may be supplied of general laws operating over nearly the whole surface of the terraqueous globe. Amongst the local provisions ancillary to these, are the monsoons of India, and the land and sea-breezes prevalent throughout the tropical coasts. When a promontory, such as that of India, intrudes into the region of the trade-winds, the continuous western current is interrupted,

and in its room appear alternating currents from the northeast and southwest, which change their direction as the Sun passes the latitude of the place. On the Malabar coast, as the Sun approaches from the southward, clouds and variable winds attend him, and his transit northward is in a week or ten days followed by that furious burst of thunder and tempest which heralds the rainy season. His southward transit is less distinctly marked; it is the sign of approaching fair weather, and is also attended by thunder and storm. The alternating land and sea-breezes are occasioned by the alternate heating and cooling of the soil, the temperature of the sea remaining nearly uniform. At present, when most powerfully felt, the earth by noon will often be found to have attained a temperature of 120°, while the sea rarely rises above 80°.* The air, heated and expanded, of course ascends, and draws from the sea a fresh supply to fill its room; the current thus generated constitutes the breeze. During the night, the earth often sinks to a temperature of 50° or 60°, cooling the conterminous air, and condensing in the form of dew, the moisture floating around. The sea is now from 15° to 20° warmer than the earth—the greatest difference between the two existing at sunrise; and in then rushes the air, and draws off a current from the shore.

"We have not noticed the tides, which, obedient to the Sun and Moon, daily convey two vast masses of water round the globe, and which twice a month, rising to an unusual height, visit elevations which otherwise are dry. During one-half of the year, the highest tides visit us by day, the other half by night, and at Bombay, at Springs, the depths of the two differ by two or three feet from each other. The tides simply rise and fall, in the open ocean, to an elevation of two or three feet in all; along our shores, and up gulfs and estuaries, they sweep with the violence of a torrent, having a general range of ten or twelve feet—sometimes, as at Fundy in America, at Brest and Milford Haven in Europe, to a height of from forty to sixty feet. They sweep our shores from filth, and purify our rivers and inlets, affording to the residents of our islands and continents the benefits of a bi-diurnal ablution, and giving a health and freshness and purity wherever they appear. Obedient to the influence of bodies many millions of miles removed from them, their subjection is not the less complete; the vast volume of water capable of crushing by its weight the most stupendous barriers that can be opposed to it, and bearing on its bosom the navies of the world, impetuously rushing against our shores, gently stops at a given line, and flows back again to its place when the word goes forth: 'Thus far shalt thou go, and no farther;' and that which no human power or contrivance could have repelled, returns at its appointed time so regularly and surely, that the hour of its approach, and measure of its mass, may be predicted with unerring certainty centuries beforehand. The hurricanes which whirl with such fearful violence over the surface, raising the waters of the sea to enormous elevations, and submerging coasts and islands, attended as they are by the fearful attributes of thunder and deluges of rain—seem requisite to deflagrate the noxious gases which have accumulated—to commingle in one healthful mass the polluted elements of the air, and restore it fitted for the ends designed for it. It is with the ordinary, not with the exceptionable, operations we have at present to deal, and the laws which rule the hurricane form themselves the subject of a treatise.

* The temperature of certain parts of the Indian Ocean—the hottest sea in the world—is 90°.—M.

"We have hitherto dealt with the sea and air—the one the medium through which the commerce of all nations is transported, the other the means by which it is moved along—as themselves the great vehicles of moisture, heat, and cold, throughout the regions of the world—the means of securing the interchange of these inestimable commodities, so that excess may be removed to where deficiency exists, deficiency substituted for excess, to the unbounded advantage of all. We have selected this group of illustrations for our views, because they are the most obvious, the most simple, and the most intelligible and beautiful that could be chosen. Short as our space is, and largely as it has already been trenched upon, we must not confine ourselves to these.

"We have already said that the atmosphere forms a spherical shell, surrounding the Earth to a depth which is unknown to us, by reason of its growing tenuity, as it is released from the pressure of its own superincumbent mass. Its upper surface cannot be nearer to us than fifty, and can scarcely be more remote than five hundred miles. It surrounds us on all sides, yet we see it not; it presses on us with a load of fifteen pounds on every square inch of surface of our bodies, or from seventy to one hundred tons on us in all, yet we do not so much as feel its weight. Softer than the finest down—more impalpable than the finest gossamer—it leaves the cobweb undisturbed, and scarcely stirs the lightest flower that feeds on the dew it supplies; yet it bears the fleets of nations on its wings around the world, and crushes the most refractory substances with its weight. When in motion, its force is sufficient to level the most stately forests, and stable buildings, with the earth—to raise the waters of the ocean into ridges like mountains, and dash the strongest ships to pieces like toys. It warms and cools by turns the Earth and the living creatures that inhabit it. It draws up vapors from the sea and land, retains them dissolved in itself, or suspended in cisterns of clouds, and throws them down again as rain or dew, when they are required. It bends the rays of the sun from their path, to give us the twilight of evening and of dawn—it disperses and refracts their various tints to beautify the approach and the retreat of the orb of day. But for the atmosphere, sunshine would burst on us and fail us at once—and at once remove us from midnight darkness to the blaze of noon. We should have no twilight to soften and beautify the landscape—no clouds to shade us from the scorching heat, but the bald Earth, as it revolved on its axis, would turn its tanned and weakened front to the full and unmitigated rays of the lord of day. It affords the gas which vivifies and warms our frames, and receives into itself that which has been polluted by use, and is thrown off as noxious. It feeds the flame of life exactly as it does that of the fire, it is in both cases consumed, and affords the food of consumption—in both cases it becomes combined with charcoal, which requires it for combustion, and is removed by it when this is over. 'It is only the girdling encircling air,' says a writer in the *North British Review*, 'that flows above and around all that makes the whole world kin. The carbonic acid with which to-day our breathing fills the air, to-morrow seeks its way round the world. The date-trees that grow round the falls of the Nile will drink it in by their leaves; the cedars of Lebanon will take of it to add to their stature; the cocoanuts of Tahiti will grow rapidly upon it; and the palms and bananas of Japan will change it into flowers. The oxygen we are breathing was distilled for us some short time ago by the magnolias of the Susquehanna, and the great trees that skirt the Orinoco

and the Amazon—the giant rhododendrons of the Himalayas contributed to it, and the roses and myrtles of Cashmere, the Cinnamon-tree of Ceylon, and the forest older than the flood, buried deep in the heart of Africa, far behind the Mountains of the Moon. The rain we see descending was thawed for us out of the icebergs which have watched the Polar Star for ages, and the lotus lilies have soaked up from the Nile, and exhaled as vapor, snows that rested on the summits of the Alps.' 'The atmosphere,' says Maun, 'which forms the outer surface of the habitable world, is a vast reservoir, into which the supply of food designed for living creatures is thrown—or, in one word, it is itself the food in its simple form of all living creatures. The animal grinds down the fibre and the tissue of the plant, or the nutritious store that has been laid up within its cells, and converts these into the substance of which its own organs are composed. The plant acquires the organs and nutritious store thus yielded up as food to the animal, from the invulnerable air surrounding it.' But animals are furnished with the means of locomotion and of seizure—they can approach their food, and lay hold of and swallow it; plants must await till their food comes to them. No solid particles find access to their frames; the restless ambient air, which rushes past them loaded with the carbon, the hydrogen, the oxygen, the water—everything they need in the shape of supplies, is constantly at hand to minister to their wants, not only to afford them food in due season, but in the shape and fashion in which alone it can avail them."

Surely a more tempting field for philosophical research, for useful and honorable labor, or a field more abounding with harvests of useful and practical results, never engaged the attention of man.

By studying the winds at sea, we might expect to find them blowing more conformably there, than on the land, to the general laws which govern the circulation of the atmosphere. And in endeavoring to learn these laws, we may look to the sea for the rule; to the land for the exceptions. It might therefore be expected that any systematic attempt to group the numerous observations made on the winds by mariners in all parts of the ocean and at all seasons of the year, would be regarded, as the illustrious Humboldt says it is, and as the learned Dr. Buist shows it to be, with no little interest by philosophers and philanthropists, by good and wise men in all conditions of life, and in all parts of the world.

In the progress of this undertaking, many new facts, of interest to science, have been brought to light, or their existence suggested by them. Our knowledge of the laws which govern the circulation of the atmosphere, which control the currents of the sea, which regulate climates, and by which heat and moisture, clouds and sunshine, are distributed over the surface of the Earth, has been considerably enlarged.

Navigation has already reaped rich fruits from this enterprise, and commerce is profiting by it. In consequence of the increase of knowledge which it has given to the practical navigator, concerning the prevailing winds and currents of the sea, the average sailing passage between distant parts of the earth has been materially shortened.

Practically, for commercial purposes, these investigations have lifted up, as it were, the markets of the southern hemisphere, and set them down by many days' sail nearer to our doors than they were before; for the time which it required a ship to carry a cargo from the United States to the equator in the Atlantic,

has been shortened more than two weeks at some seasons of the year; and it is not going too far to say, that the voyage hence to California has, in consequence of these researches, been shortened to a more remarkable extent. The average passage out, by vessels not having the results of these researches to guide them, is upwards of 180 days; but vessels with these Charts on board, have made it in 107, in 97, in 96, in 91, and even in 90 days; and their masters, after making allowance for the improved models of their ships, ascribe this great success to the information they derived from these Charts as to the winds and currents by the way.

When I was in England, in 1853, I promised the merchants and ship owners there, if they would lend their co-operation in keeping Abstract Logs, that I would point out a route to Australia by which that land of gold should be brought practically one month nearer to Europe and America, by shortening the passage for sailing vessels that much. I have received from Captain Wood a list, taken from the *Melbourne Argus*, of all the vessels that arrived there from Europe and America between the 31st December, 1853, and the 7th July, 1854. This list contains the names, with the length of passage of 362 sailing vessels. Their average passage is 124 days. The average passage of those that are known to have had the Wind and Current Charts on board was 97 days.

In former editions of this work, I predicted that on the homeward voyage, the run from Australia to Cape Horn could be made in less time than the same distance over water has ever been run under steam. I also predicted that vessels in the Australian trade would yet perform a voyage of circumnavigation in less time than the passage had ever been made to California. Both of these predictions have been fulfilled; the run to Cape Horn has been made in less than twenty-five days; and the feat of circumnavigation has been accomplished in less than eighty-nine days.

Of course, a system of investigation, having among its aims such objects as the improvement of navigation and the benefit of commerce, and counting among its results such achievements as these, could not fail to attract the attention of merchants, or to commend itself to the favorable consideration of sea-faring people generally. Taking advantage of this circumstance, the government of the United States caused the researches to be brought to the attention of other governments, and invited them to join in a conference upon the subject of a uniform system of observations at sea. This Conference met on the 23d August, 1853, in Brussels, and continued its sessions from day to day until the 8th of September. The form of the Abstract Log, and the plan of observations at sea there recommended, have been adopted by all the maritime nations of Christendom except France. So that now we have co-operating with us the nations that own at least nine-tenths of all the shipping in the world.

At that Conference I had the pleasure of meeting master spirits. I find a difficulty in expressing my ideas as to the importance of the services which they have rendered to the cause of navigation and marine meteorology. Suffice it to say, I think a new era in the history of meteorological science will be dated from that Conference. In all things connected with it, the friends of this science have but one cause of regret, and that is, that the instructions under which those twelve men met did not go further and authorize them to include the land as well as the sea in their system of observations, and so make the plan universal.

I hope that will yet be done; for the great atmospherical ocean, at the bottom of which we are creeping along, and the laws of which touch so nearly the well-being of the whole human family, embraces the land as well as the sea, and neither those laws nor the movement and phenomena of the atmosphere can be properly studied or thoroughly investigated until observations, both by sea and land, shall enable us to treat the atmosphere as a whole.

It is estimated that the system of investigations out of which the Wind and Current Charts have grown, has already led, by practically shortening the duration of voyages, to the annual saving of many millions of dollars, in the aggregate, to the commerce of those who go by them. As great, therefore, as is the benefit which commerce is deriving from the results of these observations at sea, a similar system for the shore would, I have no doubt, confer benefits as signal upon agriculture, and other industrial pursuits on land. The field of agricultural and sanitary meteorology is as rich with the promise of good " as is the ooze and bottom of the sea with sunken wrecks and sunless treasures," and I therefore hope yet to see the day when the observer at sea and the observer on shore will be acting in concert, and observing according to one uniform plan; and the more so, as such a universal system can be set on foot and carried out without involving the government that will take the initiative, or those that may second, in any expense, save the comparatively trifling cost of having the observations, after they are made, properly treated and published. The field is already filled with amateur meteorologists of all Christian tongues, who, I am assured, would most gladly volunteer their services and instruments in carrying out such a system.

Let us hope that before another edition of this work is published, another conference may be called for examining the progress that has been made under the Brussels recommendations, and for considering the improvements that experience shall have suggested in the present plan of observation, as well as for the purpose of devising a similar plan of observations for the land, and so let the world have the benefit, and science the advantages of a universal system of meteorological observations.

In the progress of this system of research, facts have been elicited which, though they have no direct relation to the course of navigation, have, nevertheless, obvious bearings upon the physical geography of the sea, and therefore are not without interest to the navigator. A small volume, treating of these facts and their bearings, has been published by the Messrs. Harper, of New York. I am permitted to transfer to these pages several chapters of that work. Indeed, were it not for swelling out the dimensions of these Sailing Directions, the entire contents of the *Physical Geography of the Sea* might, with advantage, be transferred to these pages. It is hoped that the sailor at sea will find instruction and profit by the study of them.

CHAPTER I.

THE ATMOSPHERE.*

The Circulation of the Atmosphere, Plate II. § 2.—Southeast Trade-wind Region the larger, 13.—The Offices of the Atmosphere, 14.—It is a powerful Machine, 17.—Whence come the Rains that feed the great Rivers? 19.—How vapor passes from one Hemisphere to the other, 20.—Evaporation greatest about Latitude 17°–20°, 24.—The Rainy Seasons, 28.—Rainless Regions, 30.—Why Mountains have a dry and a rainy Side, 31.—The immense Fall of Rain upon the Western Ghauts in India: how caused, 33.—Vapor for the Patagonia Rains comes from the North Pacific, 34.—The mean annual Fall of Rain, 35.—Evaporation from the Indian Ocean, 36.—Evidences of Design, 37.—Adaptation, 38.

1. THERE is no employment more worthy of the human mind than that which is afforded by tracing the evidences of design and purpose, which are visible in many parts of the creation. Hence, to the right-minded mariner, and to him who studies the physical relations of earth, sea, and air, the atmosphere is something more than a shoreless ocean, at the bottom of which his barque is wafted or driven along. It is an envelop or covering for the dispersion of light and heat over the surface of the earth; it is a sewer into which, with every breath we draw, we cast vast quantities of dead animal matter; it is a laboratory for purification, in which that matter is recompounded, and wrought again into wholesome and healthful shapes; it is a machine for pumping up all the rivers from the sea, and conveying the waters for their fountains on the ocean to their sources in the mountains.

Upon the proper working of this machine depends the well-being of every plant and animal that inhabits the earth; therefore the management of it, its movement, and the performance of its offices, can not be left to chance. They are, we may rely upon it, guided by laws that make all parts, functions, and movements of the machinery as obedient to order as are the planets in their orbits.

An examination into the economy of the universe will be sufficient to satisfy the well-balanced minds of observant men, that the laws which govern the atmosphere and the laws which govern the ocean, are laws which were put in force by the Creator when the foundations of the earth were laid; therefore, they are laws of order; else, why should the Gulf Stream, for instance, be always where it is, and running from the Gulf of Mexico, and not somewhere else, and sometimes running into it? Why should there be a perpetual drought in one part of the world, and continual showers in another? Or why should the winds and sea obey the voice of rebuke?

To one who looks abroad to contemplate the agents of nature, as he sees them at work upon our planet, no expression uttered nor act performed by them is without meaning. By such an one, the wind and rain, the vapor and the cloud, the tide, the current, the saltness, and depth, and warmth, and color of the sea, the shade of the sky, the temperature of the air, the tint and shape of the clouds, the height of the tree on the shore, the size of its leaves, the brilliancy of its flowers—each and all may be regarded as the

* *Vide* "Maury's Physical Geography of the Sea," Harper and Brothers, New York.

exponent of certain physical combinations, and therefore as the expression in which Nature chooses to announce her own doings, or, if we please, as the language in which she writes down or chooses to make known her own laws. To help us to understand that language, and to interpret aright those laws, is the object of the call which we have made upon sailors for observations at sea. No fact gathered in such a field, therefore, comes amiss to those who tread the walks of inductive philosophy; for, in the hand-book of nature, every such fact is a syllable; and it is by patiently collecting fact after fact, and by joining together syllable after syllable, that we may finally seek to read aright from the great volume which the mariner at sea and the philosopher on the mountain see spread out before them.

2. From the parallel of about 30° north and south, nearly to the equator, and extending entirely around the earth, are two zones of perpetual winds, viz: the zone of northeast trades on this side, and of southeast on that. They blow perpetually, and are as steady and as constant as the currents of the Mississippi River—always moving in the same direction (Plate II.). As these two currents of air are constantly flowing from the poles toward the equator, we are safe in assuming that the air which they keep in motion must return by some channel or other to the place near the poles whence it came in order to supply the trades. If this were not so, these winds would soon exhaust the polar regions of atmosphere, and pile it up about the equator, and then cease to blow for the want of air to make more wind of.

This return or counter-current, therefore, must be in the upper regions of the atmosphere, at least until it passes over those parallels between which the trade-winds are always blowing on the surface. These direct and counter-currents are also made to move in a sort of spiral or loxodromic curve, turning to the west as they go from the poles to the equator, and in the opposite direction as they move from the equator to the poles. This turning is caused by the rotation of the earth on its axis.

3. The earth, we know, moves from west to east. Now if we imagine a particle of atmosphere at the north pole, where it is at rest, to be put in motion in a straight line toward the equator, we can easily see how this particle of air, coming from the very axis of the pole, where it did not partake of the diurnal motion of the earth, would, in consequence of its *vis inertiæ*, find, as it travels south, the earth slipping from under it, as it were, and thus it would appear to be coming from the northeast and going toward the southwest; in other words, it would be a northeast wind.

The better to explain, let us take a common terrestrial globe for the illustration. Bring the island of Madeira, or any other place about the same parallel, under the brazen meridian; put a finger of the left hand on the place; then, moving the finger down along the meridian to the south, to represent the particle of air, turn the globe on its axis from west to east, to represent the diurnal rotation of the earth, and when the finger reaches the equator, stop. It will now be seen that the place on the globe under the finger is to the southward and westward of Madeira or the place from which the finger started; in other words, the track of the finger over the surface of the globe, like the track of the particle of air upon the earth, has been from the northward and eastward.

4. On the other hand, we can perceive how a like particle of atmosphere that starts from the equator, to take the place of the other at the pole, would, as it travels north, in consequence of its *vis inertiæ*, be

going toward the east faster than the earth. It would, therefore, appear to be blowing from the southwest, and going toward the northeast, and exactly in the opposite direction to the other. Writing south for north, the same takes place between the south pole and the equator.

Such is the process which is actually going on in nature; and if we take the motions of these two particles as the type of the motion of all, we shall have an illustration of the great currents in the air, the equator being near one of the nodes, and there being two systems of currents, an upper and an under, between it and each pole.

Halley, in his theory of the trade-winds, pointed out the key to the explanation so far, of the atmospherical circulation; but, were the explanation to rest here, a northeast trade-wind extending from the pole to the equator would satisfy it; and were this so, we should have, on the surface, no winds but the northeast trade-winds on this side, and none but southeast trade-winds on the other side, of the equator.

5. Let us return now to our northern particle (Plate II.), and follow it in a round from the north pole across the equator to the south pole, and back again. Setting off from the polar regions, this particle of air, for some reason which does not appear to have been very satisfactorily explained by philosophers, instead of travelling (§ 4) on the surface all the way from the pole to the equator, travels in the upper regions of the atmosphere for a part of the way, and until it gets near the parallel of 30°. Here it meets, also in the clouds, the hypothetical particle that is coming from the south, and going north to take its place.

6. About this parallel of 30° north, then, these two particles press against each other with the whole amount of their motive power, and produce a calm and an accumulation of atmosphere: this accumulation is sufficient to balance the pressure of the two winds from the north and south.

7. From under this bank of calms, which seamen call the "horse latitudes" (I have called them the calms of Cancer), two surface currents of wind are ejected; one toward the equator, as the northeast trades, the other toward the pole, as the southwest passage winds.

These winds come out at the lower surface of the calm region, and consequently the place of the air borne away in this manner must be supplied, we may infer, by downward currents from the superincumbent air of the calm region. Like the case of a vessel of water which has two streams from opposite directions running in at the top, and two of equal capacity discharging in opposite directions at the bottom, the motion of the water would be downward, so is the motion of the air in this calm zone.

The barometer, in this calm region, is said to stand higher than it does either to the north or to the south of it; and this is another proof as to the banking up here of the atmosphere, and pressure from its downward motion.

8. Following our imaginary particle of air from the north across this calm belt, we now feel it moving on the surface of the earth as the northeast trade-wind; and as such it continues, till it arrives near the equator, where it meets a like particle, which, starting from the south pole at the same time the other started from the north pole, has blown as the southeast trade-wind.

9. Here, at this equatorial place of meeting, there is another conflict of winds and another calm region, for a northeast and southeast wind cannot blow at the same time in the same place. The two

particles have been put in motion by the same power; they meet with equal force; and, therefore, at their place of meeting, are stopped in their course. Hence this calm belt.

10. Warmed now by the heat of the sun, and pressed on each side by the whole force of the northeast and southeast trades, these two hypothetical particles, taken as the type of the whole, cease to move onward and ascend. This operation is the reverse of that which took place at the meeting (§ 6) near the parallel of 30°.

11. This imaginary particle then, having ascended to the upper regions of the atmosphere again, travels there counter to the southeast trades, until it meets, near the calm belt of Capricorn, another particle from the south pole; here there is a descent as before (§ 7); it then (§ 4) flows on toward the south pole as a surface wind from the northwest.

Entering the polar regions obliquely, it is pressed upon by similar particles flowing in oblique currents across every meridian; and here again is a calm place or node; for, as our imaginary particle approaches the parallels near the polar calms more and more obliquely, it, with all the rest, is whirled about the pole in continued gyrations; finally, reaching the vortex or the calm place, it is carried upward to the regions of atmosphere above, whence it commences again its circuit to the north as an upper current, as far as the calm belt of Capricorn; here it encounters (§ 11) its fellow from the north (§ 4); they stop, descend, and flow out as surface currents (§ 7), the one with which the imagination is travelling, to the equatorial calms as the southeast trade-wind; here (§ 9) it ascends, travelling thence to the calm belt of Cancer as an upper current counter to the northeast trades. Here (§§ 6 and 5) it ceases to be an upper current, but, descending (§ 7), travels on with the southwest passage winds toward the pole.

Now the course we have imagined an atom of air to take is this (Plate II.): an ascent at P, the north pole; an efflux thence as an upper current (§ 5) until it meets G (also an upper current) over the calms of Cancer. Here (§ 6) there is supposed to be a descent, as shown by the arrows along the wavy lines which envelop the circle. This upper current from the pole (§ 3) now becomes the northeast trade-wind B (§ 8), on the surface, until it meets the southeast trades in the equatorial calms, when it ascends and travels as C with the upper current to the calms of Capricorn, then as D with the prevailing northwest surface current to the south pole, thence up with the arrow P, and around with the hands of a watch, and back, as indicated by the arrows along E, F, G, and H.

The Bible frequently makes allusions to the laws of nature, their operation and effects. But such allusions are often so wrapped in the folds of the peculiar and graceful drapery with which its language is occasionally clothed, that the meaning, though peeping out from its thin covering all the while, yet lies in some sense concealed, until the lights and revelations of science are thrown upon it; then it bursts out and strikes us with great force and beauty.

As our knowledge of nature and her laws has increased, so has our understanding of many passages in the Bible been improved. The Bible called the earth "the round world;" yet for ages it was considered

a heresy for Christian men to say the world is round; and, finally, sailors circumnavigated the globe, proved the Bible to be right, and confounded theologians so called.

"Canst thou bind the influences of the Pleiades?"

Astronomers of the present day, if they have not answered this question, have thrown so much light upon it as to show that, if ever it be answered by man, he must consult the science of astronomy. It has been recently established that the earth and sun, with their splendid retinue of comets, satellites, and planets, are all in motion around some point or centre of attraction inconceivably remote, and that that point is in the direction of the star Alcyon, one of the Pleiades!

Who, therefore, can ever "bind their influences?"

And as for the general system of atmospherical circulation which I have been so long endeavoring to describe, the Bible tells it all in a single sentence: "The wind goeth toward the south, and turneth about unto the north; it whirleth about continually, and the wind returneth again according to his circuits."*

12. Of course, as the surface winds H and D (Plate II.) approach the poles, there must be a sloughing off, if I may be allowed the expression, of air from the surface winds, in consequence of their approaching the poles. For as they near the poles, the parallels become smaller and smaller, and the surface current must either extend much higher up, and blow with greater rapidity as it approaches the poles, or else a part of it must be sloughed off above, and so turn back before reaching the poles. The latter is probably the case.

Investigations have shown that the southeast trade-wind region is much larger than the northeast. I speak now of its extent over the Atlantic Ocean only; that the southeast trades are the fresher, and that they often push themselves up to 10° or 15° of north latitude; whereas the northeast trade-winds of the Atlantic seldom get south of the equator.

The peculiar clouds of the trade-winds are formed between the upper and lower currents of air. They are probably formed of vapor condensed from the upper current, and evaporated as it descends by the lower and dry current from the poles. It is the same phenomenon up there which is so often observed here below; when a cool and dry current of air meets a warm and wet one, an evolution of vapor or fog ensues.

We now see the general course of the "wind in his circuits," as we see the general course of the water in a river. There are many abrading surfaces, irregularities, &c., which produce a thousand eddies in the main stream; yet, nevertheless, the general direction of the whole is not disturbed nor affected by those counter currents; so with the atmosphere and the variable winds which we find here in this latitude.

Have I not, therefore, very good grounds for the opinion (§ 1) that the "wind in his circuits," though apparently to us never so wayward, is as obedient to law and as subservient to order as were the morning stars when they "sang together?"

13. There are at least two forces concerned in driving the wind through its circuits. We have seen

* Eccl., i. 6.

(§§ 3 and 4) whence that force is derived which gives easting to the winds as they approach the equator, and westing as they approach the poles, and allusion, without explanation, has been made (§ 10) to the source whence they derive their northing and their southing. The trade-winds are caused, it is said, by the inter-tropical heat of the sun, which, expanding the air, causes it to rise up near the equator; it then flows off in the upper currents north and south, and there is a rush of air at the surface both from the north and the south to restore the equilibrium—hence the trade-winds. But to the north side of the trade-wind belt in the northern (§ 6), and on the south side in the southern hemisphere (§ 11), the prevailing direction of the winds is not toward the source of heat about the equator, but exactly in the opposite direction. In the extra-tropical region of each hemisphere the prevailing winds blow from the equator toward the poles. It therefore at first appears paradoxical to say that heat makes the easterly winds of the torrid zone blow toward the equator, and the westerly winds of the temperate zones to blow toward the poles. Let us illustrate:—

The *primum mobile* of the extra-tropical winds toward the equator is, as just intimated, generally ascribed to heat, and in this wise, viz: Suppose, for the moment, the earth to have no diurnal rotation; that it is at rest; that the rays of the sun have been cut off from it; that the atmosphere has assumed a mean uniformity of temperature, the thermometer at the equator and the thermometer at the poles giving the same reading; that the winds are still, and that the whole aerial ocean is in equilibrium and at rest. Now imagine the screen which is supposed to have shut off the influence of the sun to be removed, and the whole atmosphere to assume the various temperatures in the various parts of the world that it actually has at this moment, what would take place, supposing the uniform temperature to be a mean between the actual temperature at the equator and that at the poles? Why, this would take place; a swelling up of the atmosphere about the equator by the expansive force of intertropical heat, and a contraction of it about the poles in consequence of the cold. These two forces, considering them under their most obvious effects, would disturb the supposed atmospherical equilibrium by altering the level of the great aerial ocean; the expansive force of heat elevating it about the equator, and the contracting powers of cold depressing it about the poles. And forthwith two systems of winds would commence to blow, viz: one in the upper regions from the equator toward the poles, and as this warm and expanded air should flow toward either pole, seeking its level, a wind would blow on the surface from either pole to restore the air to the equator which the upper current had carried off.

These two winds would blow due north and south; the effects of heat at the equator, and cold at the poles, would cause them so to do. Now suppose the earth to commence its diurnal rotation; then, instead of having these winds north and south winds, they will, for reasons already explained (§ 3), approach the equator on both sides with *easting* in them, and each pole with westing.

The circumference of the earth, measured on the parallel of 60°, is only half what it is when measured on the equator. Therefore, supposing velocity to be the same, only half the volume of atmosphere (§ 13) that sets off from the equator as an upper current toward the poles can cross the parallel of 60° north or

south. The other moiety has been gradually drawn in and carried back (§ 12) by the current which is moving in the opposite direction.

Such, and such only, would be the extent of the power of the sun to create a polar and equatorial flow of air, were its power confined simply to a change of level. But the atmosphere has been invested with another property which increases its mobility, and gives the heat of the sun still more power to put it in motion, and it is this; as heat changes the atmospherical level, it changes also the specific gravity of the air acted upon. If, therefore, the level of the great aerial ocean were undisturbed by the sun's rays, and if the air were adapted to a change of specific gravity alone, without any change in volume, this quality would also be the source of at least two systems of currents in the air, viz: an upper and a lower. The two agents combined, viz: that which changes level or volume, and that which changes specific gravity, give us the general currents under consideration. Hence we say that the *primum mobile* of the air is derived from change of specific gravity induced by the freezing temperature of the polar regions, as well as from change of specific gravity due the expanding force of the sun's rays within the tropics.

Therefore, fairly to appreciate the extent of the influence due the heat of the sun in causing the winds, it should be recollected that we may with as much reason ascribe to the inter-tropical heat of the sun the northwest winds, which are the prevailing winds of the extra-tropical regions of the southern hemisphere or the southwest winds, which are the prevailing winds of the extra-tropical regions of the northern hemisphere, as we may the trade-winds, which blow in the opposite directions. Paradoxical, therefore, as it seems for us to say that the heat of the sun causes the winds between the parallels of 25° or 30° north and south to blow toward the equator, and that it also causes the prevailing winds on the polar sides of these same parallels to blow toward the poles, yet the paradox ceases when we come to recollect that by the process of equatorial heating and polar cooling which is going on in the atmosphere, the specific gravity of the air is changed as well as its level. Nevertheless, as Halley said, in his paper read before the Royal Society in London in 1686, "it is likewise very hard to conceive why the limits of the trade-wind should be fixed about the parallel of latitude 30° all around the globe, and that they should so seldom exceed or fall short of those bounds."

14. Operated upon by the equilibrating tendency of the atmosphere and by diurnal rotation, the wind approaches the north pole, for example, by a series of spirals from the southwest (§ 11). If we draw a circle about this pole on a common terrestrial globe, and intersect it by spirals to represent the direction of the wind, we shall see that the wind enters all parts of this circle from the southwest, and, consequently, that a whirl ought to be created thereby, in which the ascending column of air revolves from right to left, or *against* the hands of a watch. At the south pole the winds come from the northwest (§ 11), and consequently there they revolve about it *with* the hands of a watch.

That this should be so will be obvious to any one who will look at the arrows on the polar sides of the calms of Cancer and Capricorn (Plate II.). These arrows are intended to represent the prevailing direction of the wind at the surface of the earth.

It is a singular coincidence between these two facts thus deduced, and other facts which have been

observed, and which have been set forth by Redfield, Reid, Piddington, and others, viz: that all rotary storms in the northern hemisphere revolve as do the whirlwinds about the north pole, viz: from right to left, and that all circular gales in the southern hemisphere revolve in the opposite direction, as does the whirl about the south pole.

How can there be any connection between the rotary motion of the wind about the pole, and the rotary motion of it in a gale caused here by local agents?

That there is probably such a connection has been suggested by other facts and circumstances, for, although the theory of heat satisfies many conditions of the problem, and though heat, doubtless, is one of the chief agents in keeping up the circulation of the atmosphere, yet it can be made to appear that it is not the *sole* agent; magnetism, probably, has something to do with it.

15. So far, we see how the atmosphere moves; but the atmosphere, like every other department in the economy of nature, has its offices to perform, and they are many. I have already alluded to some of them; but I only propose, at this time, to consider some of the meteorological agencies at sea, which, in the grand design of creation, have probably been assigned to this wonderful machine.

To distribute moisture over the surface of the earth, and to temper the climate of different latitudes, it would seem, are two great offices assigned by their Creator to the ocean and the air.

When the northeast and southeast trades meet and produce the equatorial calms (§ 9), the air, by this time, is heavily laden with moisture, for in each hemisphere it has travelled obliquely over a large space of the ocean. It has no room for escape but in the upward direction (§ 10). It expands as it ascends, and becomes cooler; a portion of its vapor is thus condensed, and comes down in the shape of rain. Therefore it is that, under these calms, we have a region of constant precipitation. Old sailors tell us of such dead calms of long continuance here, of such heavy and constant rains, that they have scooped up fresh water from the surface of the sea.

The conditions to which this air is exposed here under the equator are probably not such as to cause it to precipitate all the moisture that it has taken up in its long sweep across the waters. Let us see what becomes of the rest; for Nature, in her economy, permits nothing to be taken away from the earth which is not to be restored to it again in some form, and at some time or other.

Consider the great rivers—the Amazon and the Mississippi, for example. We see them, day after day and year after year, discharging an immense volume of water into the ocean.

"All the rivers run into the sea, yet the sea is not full."—Ecc., i. 7. Where do the waters so discharged go, and where do they come from? They come from their sources, you will say. But whence are their sources supplied? for, unless what the fountain sends forth be returned to it again, it will fail and be dry.

16. We see simply, in the waters that are discharged by these rivers, the amount by which the precipitation exceeds the evaporation throughout the whole extent of valley drained by them; and by precipitation I mean the total amount of water that falls from, or is deposited by the atmosphere, whether as dew, rain, hail, or snow.

The springs of these rivers are supplied from the rains of heaven, and these rains are formed of vapors which are taken up from the sea, that "it be not full," and carried up to the mountains through the air.

"Note the place whence the rivers come, thither they return again."

17. Behold, now, the waters of the Amazon, of the Mississippi, the St. Lawrence, and all the great rivers of America, Europe, and Asia, lifted up by the atmosphere, and flowing in invisible streams back through the air to their sources among the hills, and that through channels so regular, certain, and well defined, that the quantity thus conveyed one year with the other is nearly the same: for that is the quantity which we see running down to the ocean through these rivers; and the quantity discharged annually by each river is, as far as we can judge, nearly constant.

We now begin to conceive what a powerful machine the atmosphere must be; and, though it is apparently so capricious and wayward in its movements, here is evidence of order and arrangement which we must admit, and proof which we cannot deny, that it performs this mighty office with regularity and certainty, and is therefore as obedient to law as is the steam-engine to the will of its builder.

18. It, too, is an engine. The South Seas themselves, in all their vast inter-tropical extent, are the boiler for it, and the northern hemisphere is its condenser.

19. *Where does the vapor that makes the rains which feed the rivers of the northern hemisphere come from?*

The proportion between the land and water in the northern hemisphere is very different from the proportion between them in the southern. In the northern hemisphere, the land and water are nearly equally divided. In the southern, there is several times more water than land. Most of the great rivers in the world are in the northern hemisphere, where there is less ocean to supply them. Whence, then, are their sources replenished? Those of the Amazon are supplied with rains from the equatorial calms and trade-winds of the Atlantic. That river runs east, its branches come from the north and south; it is always the rainy season on one side or the other of it; consequently, in its lower parts, it is without periodic stages of a very marked character. There it is always near its high-water mark. For one-half of the year its northern tributaries are flooded, and its southern for the other half. It discharges under the line, and as its tributaries come from both hemispheres, it cannot be said to belong exclusively to either. It is supplied with water from the Atlantic Ocean. Taking the Amazon, therefore, out of the count, the Rio de la Plata is the only great river of the southern hemisphere.

There is no large river in New Holland. The South Sea Islands give rise to none, nor is there one in South Africa that we know of.

The great rivers of North America and North Africa, and all the rivers of Europe and Asia, lie wholly within the northern hemisphere. How is it, then, considering that the evaporating surface lies mainly in the southern hemisphere—how is it, I say, that we should have the evaporation to take place in one hemisphere, and the condensation in the other? The total amount of rain which falls in the northern hemisphere is much greater, meteorologists tell us, than that which falls in the southern. The annual amount of rain in the north temperate zone is half as much again as that of the south temperate.

20. How is it, then, that this vapor gets, as stated (§ 18), from the southern into the northern hemisphere, and comes with such regularity that our rivers never go dry, and our springs fail not? It is because of the beautiful operations and the exquisite *compensation* of this grand machine, the atmosphere. It is exquisitely and wonderfully counterpoised. Late in the autumn of the north, throughout its winter, and in early spring, the sun is pouring his rays with the greatest intensity down upon the seas of the southern hemisphere, and this powerful engine which we are contemplating is pumping up the water there (§ 18) for our rivers with the greatest activity. At these seasons, the mean temperature of the entire southern hemisphere is said to be about 10° higher than the northern.

The heat which this heavy evaporation absorbs becomes latent, and, with the moisture, is carried through the upper regions of the atmosphere until it reaches our climates. Here the vapor is formed into clouds, condensed, and precipitated. The heat which held this water in the state of vapor is set free, it becomes sensible heat, and it is that which contributes so much to temper our winter climate. It clouds up in winter, turns warm, and we say we are going to have falling weather. That is because the process of condensation has already commenced, though no rain or snow may have fallen: thus we feel this southern heat, that has been collected from the rays of the sun by the sea, been bottled away by the winds in the clouds of a southern summer, and set free in the process of condensation in our northern winter.

21. If Plate II. fairly represent the course of the winds, the southeast trade-winds would enter the northern hemisphere, and, as an upper current, bear into it all their moisture, except that which is precipitated in the region of equatorial calms.

The South Seas, then, according to § 18, should supply mainly the water for this engine, while the northern hemisphere condenses it; we should, therefore, have more rain in the northern hemisphere. The rivers tell us that we have—at least on the land: for the great watercourses of the globe (§ 19), and half the fresh water in the world, are found on our side of the equator. This fact alone is strongly corroborative of this hypothesis.

The rain gauge tells us also the same story. The yearly average of rain in the north temperate zone is, according to Johnston, thirty-seven inches. He gives but twenty-six in the south temperate.

22. Moisture is never extracted from the air by subjecting it from a low to a higher temperature, but the reverse. Thus, all the air which comes loaded with moisture from the other hemisphere, and is borne into this with the southeast trade-winds, travels in the upper regions of the atmosphere (§ 6) until it reaches the calms of Cancer; here it becomes the surface wind that prevails from the southward and westward. As it goes north it grows cooler, and the process of condensation commences.

We may now liken it to the wet sponge, and the decrease of temperature to the hand that squeezes that sponge. Finally reaching the cold latitudes, all the moisture that a dew-point of zero, and even far below, can extract, is wrung from it; and this air then commences "to return according to his circuits" as dry atmosphere; and being dry, it licks up the clouds it meets on its way south, making clear weather as it goes. And here we can quote Scripture again: "The north wind driveth away rain." This is a meteorological fact of high authority and great importance in the study of the circulation of the atmosphere.

23. By reasoning in this manner, we are led to the conclusion that our rivers are supplied with their waters principally from the trade-wind regions—the extra-tropical northern rivers from the southern trades, and the extra-tropical southern rivers from the northern trade-winds, for the trade-winds are the evaporating winds.

Taking for our guide such faint glimmerings of light as we can catch from these facts, and supposing these views to be correct, then the saltest portion of the sea should be in the trade-wind regions, where the water for all the rivers is evaporated; and there the saltest portions are found.

24. Dr. Ruschenberger, of the Navy, on his late voyage to India, was kind enough to conduct a series of observations on the specific gravity of sea water. In about the parallel of 17° north and south—midway of the trade-wind regions—he found the heaviest water. Though so warm, the water there was heavier than the cold water to the south of the Cape of Good Hope. Lieutenant D. D. Porter, in the steamship Golden Age, found the heaviest water about the parallels of 20° north and 17° south.

In summing up the evidence in favor of this view of the general system of atmospherical circulation, it remains to be shown how it is, if the view be correct, there should be smaller rivers and less rain in the southern hemisphere.

25. The winds that are to blow as the northeast trade-winds, returning as upper currents from the polar regions, where the moisture (§ 22) has been compressed out of them, remain, as we have seen, dry winds until they cross the calm zone of Cancer, and are felt on the surface as the northeast trades. About two-thirds of them only can then blow over the ocean; the rest blow over the land, over Asia, Africa, and North America, where there is but comparatively a small portion of evaporating surface exposed to their action.

The zone of the northeast trades extends, on an average, from about 29° north to 7° north. Now, if we examine the globe, to see how much of this zone is land and how much water, we shall find, commencing with China and coming over Asia, the broad part of Africa, and so on, across the continent of America to the Pacific, land enough to fill up, as nearly as may be, just one-third of it. This land, if thrown into one body between these parallels, would make a belt equal to 120° of longitude by 22° of latitude.

According to the hypothesis, illustrated by Plate II., as to the circulation of the atmosphere, it is these northeast trade-winds that take up and carry over, after they rise up in the belt of equatorial calms, the vapors which make the rains that feed the rivers in the extra-tropical regions of the southern hemisphere.

Upon this supposition, then, two-thirds only of the northeast trade-winds are fully charged with moisture, and only two-thirds of the amount of rain that falls in the northern hemisphere should fall in the southern, and this is just about the proportion (§ 21) that observation gives.

26. In like manner, the southeast trade-winds take up the vapors which make our rivers, and as they prevail to a much greater extent at sea, and have exposed to their action about three times as much ocean as the northeast trade-winds have, we might expect, according to this hypothesis, more rains in the northern—and, consequently, more and larger rivers—than in the southern hemisphere. A glance at

Plate XVIII. will show how very much larger that part of the ocean over which the southeast trades prevail is than that where the northeast trade-winds blow.

27. This estimate as to the quantity of rain in the two hemispheres is one which is not capable of verification by any more than the rudest approximations; for the greater extent of southeast trades on one side, and of high mountains on the other, must each of necessity, and independent of other agents, have their effects. Nevertheless, this estimate gives as close an approximation as we can make out from any other data.

28. *The rainy seasons, how caused.*—The calm and trade-wind regions or belts move up and down the earth, annually, in latitude nearly a thousand miles. In July and August the zone of equatorial calms is found between 7° north and 12° north; sometimes higher; in March and April, between latitude 5° south and 2° north.

With this fact and these points of view before us, it is easy to perceive why it is that we have a rainy season in Oregon, a rainy and dry season in California, another at Panama, two at Bogotá, none in Peru, and one in Chili.

In Oregon it rains every month, but more in the winter months.

The winter there is the summer of the southern hemisphere, when this steam-engine is working with the greatest pressure. The vapor that is taken up by the southeast trades is borne along over the region of northeast trades to latitude 35° or 40° north (§ 21), where it descends and appears on the surface with the southwest winds of those latitudes. Driving upon the highlands of the continent, this vapor is condensed and precipitated, during this part of the year, almost in constant showers.

In the winter, the calm belt of Cancer approaches the equator. This whole system of zones, viz: of trades, calms, and westerly winds, follows the sun in declination; and they of our hemisphere are nearer the equator in the winter and spring months than at any other season.

The southwest winds commence at this season to prevail as far down as the lower part of California. In winter and spring, the land in California is cooler than the sea air, and is quite cold enough to extract moisture from it. But in summer and autumn the land is the warmer, and can not condense the vapors of water held by the air. So the same cause which made it rain in Oregon, now makes it rain in California. As the sun returns to the north, he brings the calm belt of Cancer and the northeast trades along with him; and now, at places where, six months before, the southwest winds were the prevailing winds, the northeast trades are found to blow. This is the case in the latitude of California. The prevailing winds, then, instead of going from a warmer to a cooler climate, as before, are going the opposite way. Consequently, they cannot, if they have the moisture in them to make rains of, precipitate it under such circumstances.

Panama is in the region of equatorial calms. This belt of calms travels during the year, back and forth, over about 17° of latitude, coming further north in the summer, where it tarries for several months, and then returns so as to reach its extreme southern latitude some time in March or April. Where these calms are, it is always raining, and the Chart shows that they hang over the latitude of Panama from June

to November; consequently, from June to November is the rainy season at Panama. The rest of the year that place is in the region of the northeast trades, which, before they arrive there, have to cross the mountains of the isthmus, on the cool tops of which they deposit their moisture, and leave Panama rainless and pleasant until the sun returns north with the belt of equatorial calms after him. They then push the belt of northeast trades further to the north, occupy a part of the winter zone, and refresh that part of the earth with summer rains. This belt of calms moves over more than double of its breadth, and nearly the entire motion from south to north is accomplished generally in two months, May and June.

Take the parallel of 4° north as an illustration: during these two months, the entire belt of calms crosses this parallel, and then leaves it in the region of the southeast trades. During these two months, it was pouring down rain on that parallel. After the calm belt passes it, the rains cease, and the people in that latitude have no more wet weather till the fall, when the belt of calms recrosses this parallel on its way to the south. By examining the "Trade-wind Chart," it may be seen what the latitudes are that have two rainy seasons, and that Bogotá is within the bi-rainy latitudes.

29. *The Rainless Regions.*—The coast of Peru is within the region of perpetual southeast trade-winds. Though the Peruvian shores are on the verge of the great South Sea boiler, yet it never rains there. The reason is plain.

The southeast trade-winds in the Atlantic Ocean first strike the water on the coast of Africa. Travelling to the northwest, they blow obliquely across the ocean until they reach the coast of Brazil. By this time they are heavily laden with vapor, which they continue to bear along across the continent, depositing it as they go, and supplying with it the sources of the Rio de la Plata and the southern tributaries of the Amazon.

Finally, they reach the snow-capped Andes, and here is wrung from them the last particle of moisture that that very low temperature can extract.

Reaching the summit of that range, they now tumble down as cool and dry winds on the Pacific slopes beyond. Meeting with no evaporating surface, and with no temperature *colder* than that to which they were subjected on the mountain-tops, they reach the ocean before they become charged with fresh vapor, and before, therefore, they have any which the Peruvian climate can extract. Thus we see how the top of the Andes becomes the reservoir from which are supplied the rivers of Chili and Peru.

The other rainless or almost rainless regions are the western coasts of Mexico, the deserts of Africa, Asia, North America, and Australia. Now study the geographical features of the country surrounding those regions; see how the mountain ranges run; then turn to Plate XVIII. to see how the winds blow, and where the sources are (§ 18) which supply them with vapors. This plate shows the prevailing direction of the wind only at sea; but knowing it there, we may infer what it is on the land. Supposing it to prevail on the land as it generally does in corresponding latitudes at sea, then the Plate will suggest readily enough how the winds that blow over these deserts came to be robbed of their moisture, or, rather, to have so much of it taken from them as to reduce their dew-point below the desert temperature; for *the air* (§ 22) *can never deposit its moisture when its temperature is higher than its dew-point.*

We have a rainless region about the Red Sea, because the Red Sea, for the most part, lies within the northeast trade-wind region, and these winds, when they reach that region, are dry winds, for they have as yet, in their course, crossed no wide sheets of water from which they could take up a supply of vapor.

30. Most of New Holland lies within the southeast trade-wind region; so does most of inter-tropical South America. But inter-tropical South America is the land of showers. The largest rivers and most copiously watered country in the world are to be found there, whereas almost exactly the reverse is the case in Australia. Whence this difference? Examine the direction of the winds with regard to the shore-line of these two regions, and the explanation will at once be suggested. In Australia—east coast—the shore-line is stretched out in the direction of the trades; in South America—east coast—it is perpendicular to their direction. In Australia, they fringe this shore only with their vapor, and so stint that thirsty land with showers, that the trees cannot afford to spread their leaves out to the sun, for it evaporates all the moisture from them; their instincts, therefore, teach them to turn their edges to his rays. In America, they blow perpendicularly upon the shore, penetrating the very heart of the country with their moisture. Here the leaves—as the plantain, &c.—turn their broad sides up to the sun, and court his rays.

31. *Why there is more rain on one side of a mountain than on the other.*—We may now, from what has been said, see why the Andes, and all other mountains which run north and south, have a dry and a rainy side, and how the prevailing winds of the latitude determine which is the rainy and which the dry side.

Thus, let us take the southern coast of Chili for illustration. In our summer time, when the sun comes north, and drags after him his belts of perpetual winds and calms, that coast is left within the regions of the northwest winds—the winds that are counter to the southeast trades—which, cooled by the winter temperature of the highlands of Chili, deposit their moisture copiously. During the rest of the year, the most of Chili is in the region of the southeast trades, and the same causes which operate in California to prevent rain there, operate in Chili; only the dry season in one place is the rainy season of the other.

Hence we see that the weather side of all such mountains as the Andes is the wet side, and the lee side the dry.

32. The same phenomenon, from a like cause, is repeated in inter-tropical India, only in that country each side of the mountain is made alternately the wet and the dry side by a change in the prevailing direction of the wind. Plate XVIII. shows India to be in one of the monsoon regions; it is the most famous of them all. From October to April, the northeast trades prevail. They evaporate from the Bay of Bengal water enough to feed with rains, during this season, the western shores of this bay and the Ghauts range of mountains. This range holds the relation to these winds that the Andes of Peru (§ 29) hold to the southeast trades; it first cools and then relieves them of their moisture, and they tumble down on the western slopes of the Ghauts, Peruvian-like (§ 31), cool, rainless, and dry; wherefore that narrow strip of country between the Ghauts and the Arabian Sea would, like that in Peru between the Andes and the Pacific, remain without rain forever, were it not for other agents which are at work about India and

not about Peru. The work of the agents to which I allude is felt in the monsoons, and these prevail in India and not in Peru.

33. After the northeast trades have blown out their season, which in India ends in April (§ 32), the great arid plains of Central Asia, of Tartary, Thibet, and Mongolia, become heated up, react upon these northeast trades, turn them back, and convert them, during the summer and early autumn, into southwest monsoons. These then come from the Indian Ocean and Sea of Arabia loaded with moisture, and striking with it perpendicularly upon the Ghauts, precipitate upon that narrow strip of land between this range and the Arabian Sea an amount of water that is truly astonishing. Here, then, are not only the conditions for causing more rain, now on the west, now on the east side of this mountain range, but the conditions also for the most copious precipitation. Accordingly, when we come to consult rain gauges, and to ask meteorological observers in India about the fall of rain, they tell us that on the western slopes of the Ghauts it sometimes reaches the enormous depth of twelve or fifteen inches in one day.*

These winds then continue their course to the Himalaya range as dry winds. In crossing this range, they are subjected to a lower temperature than that to which they were exposed in crossing the Ghauts. Here they drop more of their moisture in the shape of snow and rain, and then pass over into the thirsty lands beyond with scarcely enough vapor in them to make even a cloud. Thence they ascend into the upper air, there to become counter-currents in the general system of atmospherical circulation. By studying Plate XVIII., where the rainless regions and inland basins, as well as the course of the prevailing winds, are shown, these facts will become obvious.

34. *The Regions of Greatest Precipitation.*—We shall now be enabled to determine, if the views which I have been endeavoring to present be correct, what parts of the earth are subject to the greatest fall of rain. They should be on the slopes of those mountains which the trade-winds first strike, after having blown across the greatest tract of ocean. The more abrupt the elevation, and the shorter the distance between the mountain top and the ocean, the greater the amount of precipitation.

If, therefore, we commence at the parallel of about 30° north in the Pacific, where the northeast trade-winds first strike that ocean, and trace them through their circuits till they first strike high mountains, we ought to find such a place of heavy rains.

Commencing at this parallel of 30°, therefore, in the North Pacific, and tracing thence the course of the northeast trade-winds, we shall find that they blow thence, and reach the region of equatorial calms near the Caroline Islands. Here they rise up; but, instead of pursuing the same course in the upper stratum of winds through the southern hemisphere, they, in consequence of the rotation of the earth (§ 4), are made to take a southeast course. They keep in this upper stratum until they reach the calms of Capricorn, between the parallels of 30° and 40°; after which they become the prevailing northwest winds of the southern hemisphere, which correspond to the southwest of the northern. Continuing on to the southeast, they are now the surface winds; they are going from warmer to cooler latitudes; they

* Keith Johnston.

become as the wet sponge (§ 22), and are abruptly intercepted by the Andes of Patagonia, whose cold summit compresses them, and with its low dew-point squeezes the water out of them. Captain King found the astonishing fall of water here of nearly thirteen feet (one hundred and fifty-one inches) in forty-one days; and Mr. Darwin reports that the sea water along this part of the South American coast is sometimes quite fresh, from the vast quantity of rain that falls.

We ought to expect a corresponding rainy region to be found to the north of Oregon; but there the mountains are not so high, the obstruction to the southwest winds is not so abrupt, the highlands are further from the coast, and the air which these winds carry in their circulation to that part of the coast, though it be as heavily charged with moisture as at Patagonia, has a greater extent of country over which to deposit its rain, and consequently the fall to the square inch will not be as great.*

In like manner, we should be enabled to say in what part of the world the most equable climates are to be found. They are to be found in the equatorial calms, where the northeast and southeast trades meet fresh from the ocean, and keep the temperature uniform under a canopy of perpetual clouds.

35. *Amount of Evaporation.*—The mean annual fall of rain on the entire surface of the earth is estimated at about five feet.

To evaporate water enough annually from the ocean to cover the earth, on the average, five feet deep with rain; to transport it from one zone to another; and to precipitate it in the right places, at suitable times, and in the proportions due, is one of the offices of the grand atmospherical machine. This water is evaporated principally from the torrid zone. Supposing it all to come thence, we shall have, encircling the earth, a belt of ocean three thousand miles in breadth, from which this atmosphere evaporates a layer of water annually sixteen feet in depth. And to hoist up as high as the clouds, and lower down again all the water in a lake sixteen feet deep, and three thousand miles broad, and twenty-four thousand long, is the yearly business of this invisible machinery. What a powerful engine is the atmosphere! and how nicely adjusted must be all the cogs, and wheels, and springs, and pinions of this exquisite piece of machinery, that it never wears out nor breaks down, nor fails to do its work at the right time and in the right way.

36. In his annual report to the Society (*Transactions of the Bombay Geographical Society* from May, 1849, to August, 1850, vol. ix.), Dr. Buist, the secretary, states, on the authority of Mr. Laidly, that the evaporation at Calcutta is "about fifteen feet annually; that between the Cape and Calcutta it averages, in October and November, nearly three-fourths of an inch daily; between 10° and 20° in the Bay of Bengal, it was found to exceed an inch daily. Supposing this to be double the average throughout the year, we should," continues the doctor, "have eighteen feet of evaporation annually."

If, in considering the direct observations upon the daily rate of evaporation in India, it be remembered

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* I have, through the kindness of A. Holbrook, Esq., United States Attorney for Oregon, received the *Oregon Spectator* of February 13, 1851, containing the Rev. G. H. Atkinson's Meteorological Journal, kept in Oregon City during the month of January, 1851. The quantity of rain and snow for that month is 13.63 inches, or about one third the average quantity that falls at Washington during the year.

that the seasons there are divided into wet and dry; that in the dry season, evaporation in the Indian Ocean, because of its high temperature, and also of the high temperature and dry state of the wind, probably goes on as rapidly as it does anywhere else in the world; if, moreover, we remember that the regular trade-wind regions proper are, for the most part, rainless regions at sea; that evaporation is going on from them all the year round, we shall have reason to consider the estimate of sixteen feet annually for the trade-wind surface of the ocean not too high.

37. We see the light beginning to break upon us, for we now begin to perceive why it is that the proportions between the land and water were made as we find them in nature. If there had been more water and less land, we should have had more rain, and *vice versâ;* and then climates would have been different from what they now are, and the inhabitants, animal or vegetable, would not have been as they are. And as they are, that wise Being who, in his kind providence, so watches over and regards the things of this world that he takes notice of the sparrow's fall, and numbers the very hairs of our head, doubtless designed them to be.

The mind is delighted, and the imagination charmed, by contemplating the physical arrangements of the earth from such points of view as this is which we now have before us; from it the sea, and the air, and the land, appear each as a part of that grand machinery upon which the well-being of all the inhabitants of earth, sea, and air depends; and which, in the beautiful adaptations that we are pointing out, affords new and striking evidence that they all have their origin in ONE omniscient idea, just as the different parts of a watch may be considered to have been constructed and arranged according to *one* human design.

In some parts of the earth the precipitation is greater than the evaporation; thus the amount of water borne down by every river that runs into the sea may be considered as the excess of the precipitation over the evaporation that takes place in the valley drained by that river.

This excess comes from the sea; the winds convey it to the interior; and the forces of gravity, dashing it along in mountain torrents or gentle streams, hurry it back to the sea again.

In other parts of the earth, the evaporation and precipitation are exactly equal, as in those inland basins such as that in which the city of Mexico, Lake Titicaca, the Caspian Sea, &c. &c., are situated, which basins have no ocean drainage.

If more rain fell in the valley of the Caspian Sea than is evaporated from it, that sea would finally get full and overflow the whole of that great basin. If less fell than is evaporated from it again, then that sea, in the course of time, would dry up, and plants and animals there would all perish for the want of water.

In the sheets of water which we find distributed over that and every other inhabitable inland basin, we see reservoirs or evaporating surfaces just sufficient for the supply of that degree of moisture which is best adapted to the well-being of the plants and animals that people such basins.

In other parts of the earth still, we find places, as the Desert of Sahara, in which neither evaporation nor precipitation takes place, and in which we find neither plant nor animal.

38. ADAPTATIONS.—In contemplating the system of terrestrial adaptations, these researches teach one to regard the mountain ranges and the great deserts of the earth as the astronomer does the counterpoises

to his telescope—though they be mere dead weights, they are, nevertheless, necessary to make the balance complete, the adjustments of this machine perfect. These counterpoises give ease to the motions, stability to the performance, and accuracy to the workings of the instrument. They are *compensations.*

Whenever I turn to contemplate the works of nature, I am struck with the admirable system of compensation, with the beauty and nicety with which every department is poised by the others; things and principles are meted out in directions the most opposite, but in proportions so exactly balanced and nicely adjusted, that results the most harmonious are produced.

It is by the action of opposite and compensating forces that the earth is kept in its orbit, and the stars are held suspended in the azure vault of heaven; and these forces are so exquisitely adjusted, that, at the end of a thousand years, the earth, the sun, and moon, and every star in the firmament, is found to come to its proper place at the proper moment.

Nay, philosophy teaches us, when the little snow drop, which in our garden walks we see raising its beautiful head to remind us that spring is at hand, was created, that the whole mass of the earth, from pole to pole, and from circumference to centre, must have been taken into account and weighed, in order that the proper degree of strength might be given to the fibres of even this little plant.

Botanists tell us that the constitution of this plant is such as to require that, at a certain stage of its growth, the stalk should bend, and the flower should bow its head, that an operation may take place which is necessary in order that the herb should produce seed after its kind; and that, after this, its vegetable health requires that it should lift its head again and stand erect. Now, if the mass of the earth had been greater or less, the force of gravity would have been different; in that case, the strength of fibre in the snow drop, as it is, would have been too much or too little; the plant could not bow or raise its head at the right time, fecundation could not take place, and its family would have become extinct with the first individual that was planted, because its "seed" would not have been "in itself," and therefore it could not reproduce itself.

Now, if we see such perfect adaptation, such exquisite adjustment, in the case of one of the smallest flowers of the field, how much more may we not expect "compensation" in the atmosphere and the ocean, upon the right adjustment and due performance of which depends not only the life of that plant, but the well-being of every individual that is found in the entire vegetable and animal kingdoms of the world?

When the east winds blow along the Atlantic coast for a little while, they bring us air saturated with moisture from the Gulf Stream, and we complain of the sultry, oppressive, heavy atmosphere; the invalid grows worse, and the well man feels ill, because, when he takes this atmosphere into his lungs, it is already so charged with moisture that it cannot take up and carry off that which encumbers his lungs, and which nature has caused his blood to bring and leave there, that respiration may take up and carry off. At other times, the air is dry and hot; he feels that it is conveying off matter from the lungs too fast; he realizes the idea that it is consuming him, and he calls the sensation parching.

39. Therefore, in considering the general laws which govern the physical agents of the universe, and regulate them in the due performance of their offices, I have felt myself constrained to set out with the

assumption that, if the atmosphere had had a greater or less capacity for moisture, or if the proportion of land and water had been different—if the earth, air, and water had not been in exact counterpoise—the whole arrangement of the animal and vegetable kingdoms would have varied from their present state. But God chose to make those kingdoms what they are; for this purpose it was necessary, in his judgment, to establish the proportions between the land and water, and the desert, just as they are, and to make the capacity of the air to circulate heat and moisture just what it is, and to have it to do all its work in obedience to law and in subservience to order. If it were not so, why was power given to the winds to lift up and transport moisture, or the property given to the sea by which its waters may become first vapor, and then fruitful showers or gentle dews? If the proportions and properties of land, sea, and air were not adjusted according to the reciprocal capacities of all to perform the functions required by each, why should we be told that he "measured the waters in the hollow of his hand, and comprehended the dust in a measure, and weighed the mountains in scales, and the hills in a balance?" Why did he span the heavens, but that he might mete out the atmosphere in exact proportion to all the rest, and impart to it those properties and powers which it was necessary for it to have, in order that it might perform all those offices and duties for which he designed it?

Harmonious in their action, the air and sea are obedient to law and subject to order in all their movements; when we consult them in the performance of their offices, they teach us lessons concerning the wonders of the deep, the mysteries of the sky, the greatness, and the wisdom, and goodness of the Creator. The investigations into the broad-spreading circle of phenomena connected with the winds of heaven and the waves of the sea are second to none for the good which they do and the lessons which they teach. The astronomer is said to see the hand of God in the sky; but does not the right-minded mariner, who looks aloft as he ponders over these things, hear his voice in every wave of the sea that "claps its hands," and feel his presence in every breeze that blows?

CHAPTER II.

RED FOGS AND SEA DUST.*

Where found, § 40.—Tallies on the Wind, 41.—Where taken up, 42.—Information derived from Sea Dust, 43.—Its bearings upon the Theory of Atmospherical Circulation, 44.—Suggests Magnetic Agency, 45.

40. SEAMEN tell us of "red fogs" which they sometimes encounter, especially in the vicinity of the Cape de Verde Islands. In other parts of the sea also they meet showers of dust. What these showers precipitate in the Mediterranean is called "sirocco dust," and in other parts "African dust," because the winds which accompany them are supposed to come from the Sirocco Desert, or some other parched land of the

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* *Vide* Maury's Physical Geography of the Sea.

continent of Africa. It is of a brick-red or cinnamon color, and it sometimes comes down in such quantities as to cover the sails and rigging, though the vessel may be hundreds of miles from the land.

Now the patient reader, who has had the heart to follow me in the preceding chapters around with "the wind in his circuits," will perceive that proof is yet wanting to establish it as a fact, that the northeast and southeast trades, after meeting and rising up in the equatorial calms, do cross over and take the tracks represented by C and G, Plate II.

Statements, and reasons, and arguments enough have already been made and adduced to make it highly probable, according to human reasoning, that such is the case; and though the theoretical deductions showing such to be the case, be never so good, positive proof that they are true, cannot fail to be received with delight and satisfaction.

Were it possible to take a portion of this air, as it travels down the southeast trades, representing the general course of atmospherical circulation, and to put a tally on it by which we could always recognize it again, then we might hope actually to prove, by evidence the most positive, the channels through which the air of the trade-winds, after ascending at the equator, returns whence it came.

But the air is invisible; and it is not easily perceived how either marks or tallies may be put upon it, that it may be traced in its paths through the clouds.

The skeptic, therefore, who finds it hard to believe that the general circulation is such as Plate II. represents it to be, might consider himself safe in his unbelief were he to declare his willingness to give it up the moment any one should put tallies on the wings of the wind, which would enable him to recognize that air again, and those tallies, when found at other parts of the earth's surface.

As difficult as this seems to be, it has actually been done. Ehrenberg, with his microscope, has established, almost beyond a doubt, that the air which the southeast trade-winds bring to the equator does rise up there and pass over into the northern hemisphere.

41. The Sirocco, or African dust, which he has been observing so closely, has turned out to be tallies put upon the wind in the other hemisphere; and this beautiful instrument of his enables us to detect the marks on these little tallies as plainly as though those marks had been written upon labels of wood and tied to the wings of the wind.

This dust, when subjected to microscopic examination, is found to consist of infusoria and organisms whose *habitat* is not Africa, but South America, and in the southeast trade-wind region of South America. Professor Ehrenberg has examined specimens of sea dust from the Cape de Verdes and the regions thereabout, from Malta, Genoa, Lyons, and the Tyrol; and he has found a similarity among them as striking as it would have been, had these specimens been all taken from the same pile. South American forms he recognizes in all of them; indeed, they are the prevailing forms in every specimen he has examined.

It may, I think, be now regarded as an established fact, that there is a perpetual upper current of air from South America to North Africa; and that the volume of air which flows to the northward in these

upper currents is nearly equal to the volume which flows to the southward with the northeast trade-winds, there can be no doubt.

The "rain dust" has been observed most frequently to fall in spring and autumn; that is, the fall has occurred after the equinoxes, but at intervals from them varying from thirty to sixty days, more or less. To account for this sort of periodical occurrence of the falls of this dust, Ehrenberg thinks it "necessary to suppose *a dust-cloud to be held constantly swimming in the atmosphere by continuous currents of air, and lying in the region of the trade-winds, but suffering partial and periodical deviations.*"

It has already been shown (§ 28) that the rain or calm belt between the trades travels up and down the earth from north to south, making the rainy season wherever it goes. This dust is probably taken up in the dry, and not in the wet season; instead, therefore, of its being "held in clouds suffering partial and periodical deviations," as Ehrenberg suggests, it more probably comes from one place about the vernal, and from another about the autumnal equinox; for places which have their rainy season at one equinox have their dry seasons at the other.

42. At the time of the vernal equinox, the valley of the Lower Oronoco is then in its dry season—everything is parched up with the drought; the pools are dry, and the marshes and plains arid wastes. All vegetation has ceased; the great serpents and reptiles have buried themselves for hibernation;* the hum of insect life is hushed, and the stillness of death reigns through the valley.

Under these circumstances, the light breeze, raising dust from lakes that are dried up, and lifting motes from the brown savannas, will bear them away like clouds in the air.

This is the period of the year when the surface of the earth in this region, strewed with impalpable and feather-light remains of animal and vegetable organisms, is swept over by whirlwinds, gales, and tornadoes of terrific force; this is the period for the general atmospheric disturbances which have made characteristic the equinoxes. Do not these conditions appear sufficient to afford the "rain dust" for the spring showers?

At the period of the autumnal equinox, another portion of the Amazonian basin is parched with drought, and liable to winds that fill the air with dust, and with the remains of dead animal and vegetable matter; these impalpable organisms, which each rainy season calls into being, to perish the succeeding season of drought, are perhaps distended and made even lighter by the gases of decomposition which has been going on in the period of drought.

May not, therefore, the whirlwinds which accompany the vernal equinox, and sweep over the lifeless plains of the Lower Oronoco, take up the "rain dust" which descends in the northern hemisphere in April and May? and may it not be the atmospherical disturbances which accompany the autumnal equinox that take up the microscopic organisms from the Upper Oronoco and the great Amazonian basin for the showers of October?

43. Baron Humboldt, in his *Aspects of Nature*, thus contrasts the wet and the dry seasons there:—

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* Humboldt.

"When, under the vertical rays of the never-clouded sun, the carbonized turfy covering falls into dust, the indurated soil cracks asunder as if from the shock of an earthquake. If at such times two opposing currents of air, whose conflict produces a rotary motion, come in contact with the soil, the plain assumes a strange and singular aspect. Like conical-shaped clouds, the points of which descend to the earth, the sand rises through the rarefied air on the electrically-charged centre of the whirling current, resembling the loud water-spout, dreaded by the experienced mariner. The lowering sky sheds a dim, almost straw-colored light on the desolate plain. The horizon draws suddenly nearer, the steppe seems to contract, and with it the heart of the wanderer. The hot, dusty particles which fill the air increase its suffocating heat, and the east wind, blowing over the long-heated soil, brings with it no refreshment, but rather a still more burning glow. The pools, which the yellow, fading branches of the fan palm had protected from evaporation, now gradually disappear. As in the icy north the animals become torpid with cold, so here, under the influence of the parching drought, the crocodile and the boa become motionless, and fall asleep deeply buried in the dry mud. . . . . .

"The distant palm-bush, apparently raised by the influence of the contact of unequally heated and therefore unequally dense strata of air, hovers above the ground, from which it is separated by a narrow intervening margin. Half concealed by the dense clouds of dust, restless with the pain of thirst and hunger, the horses and cattle roam around, the cattle lowing dismally, and the horses stretching out their long necks and snuffing the wind, if haply a moister current may betray the neighborhood of a not wholly dried-up pool. . . . . .

"At length, after the long drought, the welcome season of the rain arrives; and then how suddenly is the scene changed! . . . . . .

"Hardly has the surface of the earth received the refreshing moisture, when the previously barren steppe begins to exhale sweet odors, and to clothe itself with killingias, the many panicles of the paspulum, and a variety of grasses. The herbaceous mimosas, with renewed sensibility to the influence of light, unfold their drooping, slumbering leaves to greet the rising sun; and the early song of birds and the opening blossoms of the water plants join to salute the morning."

The color of the "rain dust," when collected in parcels and sent to Ehrenberg, is "brick red," or "yellow ochre;" when seen by Humboldt in the air, it was less deeply shaded, and is described *by him* as imparting a "straw-color" to the atmosphere. In the search of spider lines for the diaphragm of my telescopes, I procured the finest and best threads from a cocoon of a mud-red color; but the threads of this cocoon, as seen singly in the diaphragm, were of a golden color; there would seem, therefore, no difficulty in reconciling the difference between the colors of the rain dust, when viewed in little piles by the microscopist, and when seen attenuated and floating in the wind by the great traveller.

It appears, therefore, that we here have placed in our hands a clew, which, attenuated and gossamer-like though it at first appears, is nevertheless palpable and strong enough to guide us along the "circuits of the wind" till we enter "the chambers of the south."

The frequency of the fall of "rain dust" between the parallels of 17° and 25° north, and in the

vicinity of the Cape Verde Islands, is remarked upon with emphasis by the microscopist. It is worthy of remark, because, in connection with the investigations at the Observatory, it is significant.

The latitudinal limits of the northern edge of the northeast trade-winds are variable. In the spring, they are nearest to the equator, extending sometimes, at this season, not further from the equator than the parallel of 15° north.

44. The breadth of the calms of Cancer is also variable; so also are their limits. The extreme vibration of this zone is between the parallels of 17° and 38° north, according to the season of the year.

According to the hypothesis suggested by my researches, this is the zone in which the upper currents of atmosphere that ascended in the equatorial calms, and flowed off to the northward and eastward, are supposed to descend. This, therefore, is the zone in which the atmosphere that bears the "rain dust," or "African sand," descends to the surface; and this, therefore, is the zone, it might be supposed, which would be the most liable to showers of this "dust." This is the zone in which the Cape Verde Islands are situated; they are in the direction which theory gives to the upper current of air from the Oronoco and Amazon with its "rain dust," and they are in the region of the most frequent showers of "rain dust," all of which are in striking conformity with this theory as to the circulation of the atmosphere.

It is true that, in the present state of our information, we cannot tell why this "rain dust" should not be gradually precipitated from this upper current, and descend into the stratum of trade-winds, as it passes from the equator to higher northern latitudes; neither can we tell why the vapor which the same winds carry along should not, in like manner, be precipitated on the way; nor why we should have a thunder-storm, a gale of wind, or the display of any other atmospherical phenomenon to-morrow, and not to-day; all that we can say is, that the conditions of to-day are not such as the phenomenon requires for its own development.

Therefore, though we cannot tell why the sea dust should not fall always in the same place, we may nevertheless suppose that it is not always in the atmosphere, for the storms that take it up occur only occasionally, and that when up, and in passing the same parallels, it does not always meet with the conditions—electrical and others—favorable to its descent, and that these conditions might occur now in this place, now in that. But that the fall does occur always in the same atmospherical vein or general direction, my investigations would suggest, and Ehrenberg's researches prove.

Judging by the fall of sea or rain dust, we may suppose that the currents in the upper regions of the atmosphere are remarkable for their general regularity, as well as for their general direction and sharpness of limits, so to speak.

We may imagine that certain electrical conditions are necessary to a shower of "sea dust" as well as to a thunder-storm; and that the interval between the time of the equinoctial disturbances in the atmosphere and the occurrence of these showers, though it does not enable us to determine the true rate of motion in the general system of atmospherical circulation, yet it assures us that it is not less on the average than a certain rate.

I do not offer these remarks as an explanation with which we ought to rest satisfied, provided other

proof can be obtained; I rather offer them in the true philosophical spirit of the distinguished microscopist himself, simply as affording, as far as they are entitled to be called an explanation, that explanation which is most in conformity with the facts before us, and which is suggested by the results of a novel and beautiful system of philosophical research.

45. Thus, though we have tallied the air, and put labels on the wind, to "tell whence it cometh and whither it goeth," yet there evidently is an agent concerned in the circulation of the atmosphere whose functions are manifest, but whose presence has never yet been clearly recognized.

When the air which the northeast trade-winds bring down meets in the equatorial calms that which the southeast trade-winds convey, and the two rise up together, what is it that makes them cross? where is the power that guides that from the north over to the south, and that from the south up to the north?

I have devoted a chapter in my work, on the *Physical Geography of the Sea*, to answering this question, and stating the circumstances which suggest magnetism as the agent. Those who have any desire to investigate the subject are referred to that little book.

CHAPTER III.

THE WINDS.*

Plate XVIII., § 46.—Monsoons, 47.—Why the Belt of Southeast is broader than the Belt of Northeast Trade-winds, 48.—Effect of Deserts upon the Trade-winds, 49.—At Sea the Laws of Atmospherical Circulation are better developed, 50.—Rain Winds, 51.—Precipitation on Land greater than Evaporation, 52.—The Place of Supply for the Vapors that feed the Amazon with Rains, 53.—Monsoons: How formed, 54.—Monsoons of the Indian Ocean, 55.—How caused, 56.—How the Monsoon Season may be known, 57.—Why there are no Monsoons in the Southern Hemisphere, 59.—Why the Trade-wind Zones are not stationary, 60.—The Calm Belts, 61.—The Westerly Winds, 63.

46. Plate XVIII. is a chart of the winds, based on information derived from the Pilot Charts. The object of this chart is to make the young seamen acquainted only with the *prevailing* direction of the wind in every part of the ocean.

The arrows of the plate are supposed to fly with the wind; the half bearded and half feathered arrows denoting monsoons or periodic winds; the dotted belts, the regions of calm and baffling winds.

47. Monsoons, properly speaking, are winds which blow one half of the year from one direction, and the other half from an opposite, or nearly an opposite direction.

Let us commence the study of Plate XVIII., by examining the trade-wind region; for that is the region in which monsoons are most apt to be found.

48. The belt or zone of the southeast trade-winds is broader (§ 12), it will be observed, than the belt or zone of northeast trades. This phenomenon is explained by the fact that there is more land in the

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* *Vide* Physical Geography of the Sea. Harper and Brothers, New York.

northern hemisphere, and that most of the deserts of the earth—as the great deserts of Asia and Africa—are situated in the rear, or behind the northeast trades; so that as these deserts become more or less heated, there is a call—a pulling back, if you please—upon these trades to flow back and restore the equilibrium which the deserts destroy. There being no, or few such regions in the rear of the southeast trades, they obey the first impulse, push and press over into the northern hemisphere.

By resolving the forces which it is supposed are the principal forces that put these winds in motion, viz: calorific action of the sun and diurnal rotation of the earth, we are led to the conclusion that the latter is much the greater of the two in its effects upon those of the northern hemisphere. But not to such an extent is it greater in its effects upon those of the southern. We see by the plate that those two opposing currents of wind are so unequally balanced that the one recedes before the other, and that the current from the southern hemisphere is larger in volume; *i. e.* it moves a greater zone or belt of air. The southeast trade-winds discharge themselves over the equator—*i. e.* across a great circle—into the region of equatorial calms, while the northeast trade-winds discharge themselves into the same region over a parallel of latitude, and consequently over a small circle. If, therefore, we take what obtains in the Atlantic as the type of what obtains entirely around the earth, as it regards the trade-winds, we shall see that the southeast trade-winds keep in motion more air than the northeast do, by a quantity at least proportioned to the difference between the circumference of the earth at the equator and at the parallel of latitude of 9° north. For, if we suppose that those two perpetual currents of air extend the same distance from the surface of the earth, and move with the same velocity, a greater volume from the south would flow across the equator in a given time than would flow from the north over the parallel of 9° in the same time; the ratio between the two quantities would be as radius to the secant of 9°. Besides this, the quantity of land lying within and to the north of the region of the northeast trade-winds is much greater than the quantity within and to the south of the region of the southeast trade-winds. In consequence of this, the mean level of the earth's surface within the region of the northeast trade-winds is, it may reasonably be supposed, somewhat above the mean level of that part which is within the region of the southeast trade-winds. And as the northeast trade-winds blow under the influence of a greater extent of land surface than the southeast trades do, the former are more obstructed in their course than the latter by the forests, the mountain ranges, unequally heated surfaces, and other such like inequalities.

As already stated, the investigations show that the momentum of the southeast trade-winds is sufficient to push the equatorial limits of their northern congeners back into the northern hemisphere, and to keep them, at a mean, as far north as the ninth parallel of north latitude. Besides this fact, they also indicate that while the northeast trade-winds, so called, make an angle in their general course of about 23° with the equator (east-northeast), those of the southeast make an angle of 30° or more with the equator (southeast by east.) I speak of those in the Atlantic, thus indicating that the latter approach the equator more directly in their course than do the others, and that, consequently, the effect of the diurnal rotation of the earth being the same for like parallels, north and south, the calorific influence of the sun exerts more power in giving motion to the southern than to the northern system of Atlantic trade-winds.

49. That such is actually the case is rendered still more probable from this consideration: All the great deserts are in the northern hemisphere, and the land surface is also much greater on our side of the equator. The action of the sun upon these unequally absorbing and radiating surfaces in and behind, or to the northward of the northeast trades, tends to retard these winds, and to draw large volumes of the atmosphere, that otherwise would be moved by them, back to supply the partial vacuum made by the heat of the sun, as it pours down its rays upon the vast plains of burning sands and unequally heated land surfaces in our overheated hemisphere. The northwest winds of the southern are also and consequently stronger than the southwest winds of the northern hemisphere.

The investigations that have taken place show that the influence of the land upon the normal directions of the wind at sea is an immense influence. It is frequently traced for a thousand miles or more out upon the ocean. For instance, the action of the sun's rays upon the great deserts and arid plains of Africa, in the summer and autumnal months, is such as to be felt nearly across the Atlantic Ocean between the equator and the parallel of 13° north. Between this parallel and the equator, the trade-winds are turned back by the heated plains of Africa, and are caused to blow a regular southwardly monsoon for several months. They bring the rains which divide the season in these parts of the African coast. The region of the ocean embraced by the monsoons is cuneiform in its shape, having its base resting upon Africa, and its apex stretching over till within 10° or 15° of the mouth of the Amazon.

Indeed, when we come to study the effects of South America and Africa (as developed by the Wind and Current Charts) upon the winds at sea, we should be led to the conclusion—had the foot of civilized man never trod the interior of these two continents—that the climate of one is humid; that its valleys are, for the most part, covered with vegetation, which protects its surface from the sun's rays; while the plains of the other are arid and naked, and, for the most part, act like furnaces in drawing the winds from the sea to supply air for the ascending columns which rise from its overheated plains.

Pushing these facts and arguments still further, these beautiful and interesting researches seem already sufficient almost to justify the assertion that, were it not for the Great Desert of Sahara, and other arid plains of Africa, the western shores of that continent, within the trade-wind region, would be almost, if not altogether, as rainless and sterile as the desert itself.

These investigations, with their beautiful developments, eagerly captivate the mind; giving wings to the imagination, they teach us to regard the sandy deserts, and arid plains, and the inland basins of the earth, as compensations in the great system of atmospherical circulation. Like counterpoises to the telescope, which the astronomer regards as incumbrances to his instrument, these wastes serve as make-weights, to give certainty and smoothness of motion—facility and accuracy to the workings of the machine.

50. When we travel out upon the ocean, and get beyond the influence of the land upon the winds, we find ourselves in a field particularly favorable for studying the general laws of atmospherical circulation. Here, beyond the reach of the great equatorial and polar currents of the sea, there are no unduly heated surfaces, no mountain ranges, or other obstructions to the circulation of the atmosphere—nothing to disturb it in its natural courses. The sea, therefore, is the field for observing the operations of the general laws

which govern the movements of the great aerial ocean. Observations on the land will enable us to discover the exceptions. But from the sea we shall get the rule. Each valley, every mountain range and local district, may be said to have its own peculiar system of calms, winds, rains, and droughts. But not so the surface of the broad ocean; over it the agents which are at work are of a uniform character.

51. RAIN-WINDS are the winds which convey the vapor from the sea, where it is taken up, to other parts of the earth, where it is let down either as snow, hail, or rain. As a general rule, the trade-winds may be regarded as the evaporating winds; and when, in the course of their circuit, they become monsoons, or the variables of either hemisphere, they then generally become also the rain-winds—especially the monsoons for certain localities. Thus, the southwest monsoons of the Indian Ocean are the rain-winds for the west coast of the Peninsula (§ 33). In like manner, the African monsoons of the Atlantic are the winds which feed the springs of the Niger and the Senegal with rains.

52. Upon every water-shed which is drained into the sea, the precipitation may be considered as greater than the evaporation, for the whole extent of the shed so drained, by the amount of water which runs off through the river into the sea. In this view, all rivers may be regarded as immense rain-gauges, and the volume of water annually discharged by any one, as an expression of the quantity which is annually evaporated from the sea, carried back by the winds, and precipitated throughout the whole extent of the valley that is drained by it. Now, if we knew the rain-winds from the dry, for each locality and season generally throughout such a basin, we should be enabled to determine, with some degree of probability at least, as to the part of the ocean from which such rains were evaporated. And thus, notwithstanding all the eddies caused by mountain chains, and other uneven surfaces, we might detect the general course of the atmospherical circulation over the land as well as the sea, and make the general courses of circulation in each valley as obvious to the mind of the philosopher as is the current of the Mississippi, or of any other great river, to his senses.

53. These investigations as to the rain-winds at sea, indicate that the vapors which supply the sources of the Amazon with rain are taken up from the Atlantic Ocean by the northeast and southeast trade-winds; and many circumstances, some of which have already been detailed, tend to show that the winds which feed the Mississippi with rains get their vapor in the southeast trade-wind region of the other hemisphere. For instance, we know from observation that the trade-wind regions of the ocean, beyond the immediate vicinity of the land, are, for the most part, rainless regions, and that the trade-wind zones may be described, in a hyetographic sense, as the evaporating regions. They also show, or rather indicate as a general rule, that, leaving the polar limits of the two trade-wind systems, and approaching the nearest pole, the precipitation is greater than the evaporation until the point of maximum cold is reached.

And we know, also, that, as a *general* rule, the southeast and northeast trade-winds which come from a lower and go to a higher temperature are the evaporating winds, *i. e.* they evaporate more than they precipitate; while those winds which come from a higher and go to a lower temperature are the rain-winds, *i. e.* they precipitate more than they evaporate. That such is the case, not only do researches indicate, but reason teaches, and philosophy tells.

These views, therefore, suggest the inquiry as to the sufficiency of the Atlantic, after supplying the sources of the Amazon and its tributaries with their waters, to supply also the sources of the Mississippi and the St. Lawrence, and of all the rivers, great and small, of North America and Europe.

A careful study of the rain-winds, in connection with the Wind and Current Charts, will probably indicate to us the "springs in the ocean" which supply the vapors for the rains that are carried off by those great rivers. "All the rivers run into the sea; yet the sea is not full; unto the place from whence the rivers come, thither they return again."

54. MONSOONS (§ 47) are, for the most part, formed of trade-winds. When a trade-wind is turned back or diverted by overheated districts from its regular course at stated seasons of the year, it is regarded as a monsoon. Thus the African monsoons of the Atlantic (Plate XVIII.), the monsoons of the Gulf of Mexico, and the Central American monsoons of the Pacific, are, for the most part, formed of the northeast trade-winds, which are turned back to restore the equilibrium which the overheated plains of Africa, Utah, Texas, and New Mexico have disturbed. When the monsoons prevail for five months at a time, for it takes about a month for them to change and become settled, then both they and the trade-winds, of which they are formed, are called monsoons.

55. The northeast and the southwest monsoons of the Indian Ocean afford an example of this kind. A force is exerted upon the northeast trade-winds of that sea by the disturbance which the heat of summer creates in the atmosphere over the interior plains of Asia, which is more than sufficient to neutralize the forces which cause those winds to blow as trade-winds; it turns them back; and were it not for the peculiar conditions of the land about that ocean, what are now called the northeast monsoons would blow the year round; there would be no southwest monsoons; and the northeast winds, being perpetual, would become all the year, what in reality for five months (§ 54) they are, viz: northeast trade-winds.

56. The agents which produce monsoons reside (§ 55) on the land. These winds are caused by the rarefaction of the air over large districts of country situated on the polar edge, or near the polar edge of the trade-winds. Thus the monsoons of the Indian Ocean are caused by the intense heat which the rays of a cloudless sun produce during the summer time upon the Desert of Cobi and the burning plains of Central Asia. When the sun is north of the equator, the force of his rays, beating down upon these wide and thirsty plains, is such as to cause the vast superincumbent body of air to expand and ascend. There is, consequently, a rush of air, especially from toward the equator, to restore the equilibrium; and in this case, the force which tends to draw the northeast trade-winds back becomes greater than the force which is acting to propel them forward. Consequently, they obey the stronger power, turn back, and become the famous southwest monsoons of the Indian Ocean, which blow from May to September inclusive.

Of course, the vast plains of Asia are not brought up to monsoon heat *per saltum* or in a day. They require time both to be heated up to this point and to be cooled down again. Hence, there is a conflict for a few weeks about the change of the monsoon, when neither the trade-wind nor the monsoon force has fairly lost or gained the ascendency. This debatable period amounts to about a month at each change. So that the monsoons of the Indian Ocean prevail really for about five months each way, viz: from May

to September, from the southwest, in obedience to the influence of the overheated plains, and from November to March, inclusive, from the northeast, in obedience to the trade-wind force.

57. The monsoon season may be always known by referring to the cause which produces these winds. Thus, by recollecting where the thirsty and overheated plains are which cause the monsoons, we know at once that these winds are rushing with greatest force toward these plains at the time that is the hottest season of the year upon them.

The influence of these heated plains upon the winds at sea is felt for a thousand miles and more. Thus, though the Desert of Cobi and the sun-burnt plains of Asia are, for the most part, north of latitude 30°, their influence in making monsoons is felt south of the equator (Plate XVIII.). So, too, with the great Desert of Sahara and the African monsoons of the Atlantic; also, with the Salt Lake country and the Mexican monsoons on one side, and those of Central America in the Pacific on the other. The influence of the deserts of Arabia upon the winds is felt in Austria and other parts of Europe, as the observations of Kriel, Lamont, and others show.

58. It would appear, therefore, that these desert countries exercise a powerful influence in checking, and consequently in weakening, the force of the northeast trade-winds. There are no such extensive influences at work checking the southeast trades. On the contrary, these are accelerated; for the same forces that serve to draw the northeast trade-winds back, or retard them, tend also to draw the southeast trade-winds on, or to accelerate them. Hence the ability of the southeast trade-winds to push themselves over into the northern hemisphere.

Hence, also, we infer that, between certain parallels of latitude in the northern hemisphere, the sun's rays, by reason of the great extent of land surface, operate with much more intensity than they do between corresponding parallels in the southern; and that, consequently, the mean summer temperature on shore, north of the equator, is higher than it is south—a beautiful physical fact which the winds have revealed, in corroboration of what observations with the thermometer had already induced meteorologists to suspect.

59. It appears, from what has been said (§ 54), that it is the rays of the sun operating upon the land, not upon the water, which causes the monsoons. Now let us turn to Plate XVIII. and examine into this view. The monsoon regions are marked with half-bearded and half-feathered arrows; and we perceive, looking at the northern hemisphere, that all of Europe, some of Africa, most of Asia, and nearly the whole of North America, are to the north, or on the polar side of the northeast trade-wind zone; whereas but a small part of Australia, less of South America, and still less of South Africa, are situated on the polar side of the zone of southeast trade-winds. In other words, there are no great plains on the polar side of the southeast trade-winds upon which the rays of the sun, in the summer of the other hemisphere, can play with force enough to rarefy the air sufficiently to materially interrupt these winds in their course. But, besides the vast area of such plains in the northern hemisphere, on the polar side of its trade-wind belt, the heat of which is sufficient (§ 57) to draw these trade-winds back, there are numerous other districts in the extra-tropical regions of our hemisphere, the summer heat of which, though it be not sufficient to turn the northeast trade-winds back, and make a monsoon of them, yet may be sufficient to

weaken them in their force, and, by retarding them (§ 58), draw the southeast trade-winds over into the northern hemisphere.

60. Now, as this interference from the land takes place in the summer only, we might infer, without appealing to actual observation, that the position of these trade-wind zones is variable; that is, that the equatorial edge of the southeast trade-wind zones is further to the north in our summer, when the northeast trades are most feeble, than it is in winter, when they are strongest.

We have here, then, at work upon these trade-wind zones, a force now weak, now strong, which, of course, would cause these zones to vibrate up and down the ocean, and within certain limits, according to the season of the year. These limits are given on Plate XVIII. for spring and autumn. During the latter season, these zones reach their extreme northern declination, and in our spring their utmost limits toward the south.

61. The Calm Belts.—There is between the two systems of trade-winds a region of calms, known as the equatorial calms. It has a mean average breadth of about six degrees of latitude. In this region, the air which is brought to the equator by the northeast and southeast trades ascends. This belt of calms always separates these two trade-wind zones, and travels up and down with them. If we liken this belt of equatorial calms to an immense atmospherical trough, extending, as it does, entirely around the earth, and if we liken the northeast and southeast trade-winds to two streams discharging themselves into it, we shall see that we have two currents perpetually running in at the bottom, and that, therefore, we must have as much air as the two currents bring in at the bottom to flow out at the top. What flows out at the top is carried back north and south by these upper currents, which are thus proved to exist and to flow counter to the trade-winds.

Using still further this mode of illustration: if we liken the calm belt of Cancer and the calm belt of Capricorn each to a great atmospherical trough extending around the earth also, we shall see that in this case the currents are running in at the top and out at the bottom (§ 7).

The belt of equatorial calms is a belt of constant precipitation. Captain Wilkes, of the Exploring Expedition, when he crossed it in 1838, found it to extend from 4° north to 12° north. He was ten days in crossing it, and during those ten days rain fell to the depth of 6.15 inches, or at the rate of eighteen feet and upward during the year. In the summer months, this belt of calms is found between the parallels of 8° and 14° of north latitude; and, in the spring, between 5° south and 4° north.

This calm belt carries with it the rainy seasons of the torrid zone, always, in its motions from south to north and back, arriving at certain parallels at stated periods of the year; consequently, by attentively considering Plate XVIII., one can tell what places within the range of this zone have, during the year, two rainy seasons, what one, and what are the rainy months for each locality.

Were the northeast and the southeast trades, with the belt of equatorial calms, of different colors, and visible to an astronomer in one of the planets, he might, by the motion of these belts or girdles alone, tell the seasons with us. He would see them at one season going north, then appearing stationary, and then commencing their return to the south. But, though he would observe (§ 28) that they follow the sun in

his annual course, he would remark that they do not change their latitude as much as the sun does his declination; he would, therefore, discover that their extremes of declination are not so far asunder as the tropics of Cancer and Capricorn, though in certain seasons the changes from day to day are very great. He would observe that these zones of winds and calms have their tropics or stationary nodes, about which they linger near three months at a time; and that they pass from one of their tropics to the other in a little less than another three months. Thus he would observe the whole system of belts to go north from the latter part of May till some time in August. Then they would stop and remain stationary till winter, in December; when again they would commence to move rapidly over the ocean, and down toward the south, until the last of February or the first of March; then, again, they would become stationary, and remain about this, their southern tropic, till May again.

62. THE HORSE LATITUDES.—Having completed the physical examination of the equatorial calms and winds, if the supposed observer should now turn his telescope toward the poles of our earth, he would observe a zone of calms bordering the northeast trade-winds on the north (§ 6), and another bordering the southeast trade-winds on the south (§ 11). These calm zones also would be observed to vibrate up and down with the trade-wind zones, partaking (§ 28) of their motions, and following the declination of the sun.

On the polar side of each of these two calm zones there would be a broad band extending up into the polar regions, the prevailing winds within which are the opposites of the trade-winds, viz: southwest in the northern and northwest in the southern hemisphere.

The equatorial edge of these calm belts is near the tropics, and their average breadth is 10° or 12°. On one side of these belts (§ 7), the winds blow perpetually toward the equator; on the other, their prevailing direction is towards the poles. They are called (§ 7) the "horse latitudes" by seamen.

Along the polar borders of these two calm belts (§ 28) we have another region of precipitation, though generally the rains here are not so constant as they are in the equatorial calms. The precipitation near the tropical calms is nevertheless sufficient to mark the seasons; for whenever these calm zones, as they go from north to south with the sun, leave a given parallel, the rainy season of that parallel, if it be in winter, is said to commence. Hence, we may explain the rainy season in Chili at the south, and in California at the north.

63. THE WESTERLY WINDS.—To complete the physical examination of the earth's atmosphere, which we have supposed an astronomer in one of the planets to have undertaken, according to the facts developed by the Wind and Current Charts, it remains for him to turn his telescope upon the southwest passage winds of the northern hemisphere, pursue them into the arctic regions, and see theoretically how they get there, and, being there, what becomes of them.

From the parallel of 40° up toward the north pole, the prevailing winds, as already remarked, are the southwest passage winds (Plate XVIII.), or, as they are more generally called by mariners, the "westerly" winds; these, in the Atlantic, prevail over the "easterly" winds in the ratio of about two to one.

Now if we suppose, and such is probably the case, these "westerly" winds to convey in two days a

greater volume of atmosphere toward the arctic circle than those "easterly" winds can bring back in one, we establish the necessity for an upper current by which this difference may be returned to the tropical calms of our hemisphere (§ 13). Therefore, there must be some place in the polar regions at which these southwest winds cease to go north, and from which they commence their return to the south, and this locality must be in a region peculiarly liable to calms. It is another atmospherical node in which the motion of the air is upward, with a decrease of barometric pressure. It is marked P, Plate II.

If we now return to the calm belt of the northern tropic, and trace theoretically a portion of air that, in its circuit, shall fairly represent the average course of these southwest passage winds, we shall see (§ 14) that it approaches the pole in a loxodromic curve; that as it approaches the pole, it acquires, from the spiral convolutions of this curve which represents its path, a whirling motion, in a direction *contrary* to that of the hands of a watch; and that the portion of atmosphere whose path we are following would gradually contract its gyrations, until it would finally ascend, turning against the hands of a watch as it whirls around.

In the southern hemisphere, a like process is going on; only there, the northwest passage wind would, as it arrives near the antarctic calms, acquire a motion with the sun, or in the direction of the hands of a watch.

CHAPTER IV.

ON THE GEOLOGICAL AGENCY OF THE WINDS.*

To appreciate the Offices of the Winds and Waves, Nature must be regarded as a Whole, § 64.—The Dead Sea, 65.—The Effect produced by the Upheaval of Mountains across the course of vapor-bearing Winds, 67.—Effect of the Andes upon vapor-bearing Winds, 69.—Geological Age of the Andes and Dead Sea compared, 70.—Rain and Evaporation in the Mediterranean, 71.—Evaporation and Precipitation in the Caspian Sea equal, 72.—The Quantity of Moisture the Atmosphere keeps in Circulation, 73.—Where Vapor for the Rains that feed the Nile comes from, 74.—Lake Titicaca, 75.

64. PROPERLY to appreciate the various offices which the winds and the waves perform, we must regard nature as a whole, for all the departments thereof are intimately connected. If we attempt to study one of them, we often find ourselves tracing clews which lead us off insensibly into others, and, before we are aware, we discover ourselves exploring the chambers of some other department.

The study of drift takes the geologist out to sea, and reminds him that a knowledge of waves, winds, and currents, of navigation and hydrography, are closely and intimately connected with his favorite pursuit.

The astronomer directs his telescope to the most remote star, or to the nearest planet in the sky, and

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* *Vide* Maury's Physical Geography of the Sea.

makes an observation upon it. He cannot reduce this observation, nor make any use of it, until he has availed himself of certain principles of optics; until he has consulted the thermometer, gauged the atmosphere, and considered the effect of heat in changing its powers of refraction. In order to adjust the pendulum of his clock to the right length, he has to measure the water of the sea and weigh the earth. He, too, must therefore go into the study of the tides; he must examine the earth's crust and consider the matter of which it is composed, from pole to pole, circumference to centre; and in doing this, he finds himself, in his researches, right alongside of the navigator, the geologist, and the meteorologist, with a host of other good fellows, each one holding by the same thread, and following it up into the same labyrinth —all, it may be, with different objects in view, but, nevertheless, each thread will be sure to lead them where there are stores of knowledge for all, and instruction for each one in particular. And thus, in undertaking to explore the physical geography of the sea, I have found myself standing side by side with the geologist on the land, and with him, far away from the sea-shore, engaged in considering some of the phenomena which the inland basins of the earth—those immense indentations on its surface that have no sea-drainage—present for contemplation and study.

65. Among the most interesting of these is that of the Dead Sea. Lieutenant Lynch, of the United States Navy, has run a level from that sea to the Mediterranean, and finds the former to be about one thousand three hundred feet below the general sea-level of the earth. In seeking to account for this great difference of water-level, the geologist examines the neighboring region, and calls to his aid the forces of elevation and depression which are supposed to have resided in the neighborhood; he then points to them as the agents which did the work. Truly they are mighty agents, and they have diversified the surface of the earth with the most towering monuments of their power. But is it necessary to suppose that they resided in the vicinity of this region? May they not have come from the sea, and been, if not in this case, at least in the case of other inland basins, as far removed as the other hemisphere? The inquiry as to the geological agency of the winds in such cases is a question which my investigations have suggested; and I propound it as one which, in accounting for the formation of this or that inland basin, is worthy, at least, of consideration.

Is there any evidence that the annual amount of precipitation upon the water-shed of the Dead Sea, at some former period, was greater than the annual amount of evaporation from it now is? If yea, from what part of the sea did the vapor that supplied the excess of that precipitation come, and what has cut off that supply? The mere elevation and depression of the lake basin (§ 65) would not do it.

If we establish the fact that the Dead Sea at a former period did send a river to the ocean, we carry along with it the admission that when the sea overflowed into that river, then the water that fell from the clouds over the Dead Sea basin was more than the winds could convert into vapor and carry away again; the river carried off the excess to the ocean whence it came (§ 15).

In the basin of the Dead Sea, in the basin of the Caspian, of the Sea of Aral, and in the other inland basins of Asia, we are entitled to infer that the precipitation and evaporation are at this time exactly equal. Were it not so, the level of these seas would be rising or sinking. If the precipitation were in excess,

these seas would be gradually becoming fuller; and if the evaporation were in excess, they would be gradually drying up; but observation does not show, nor history tell us, that either is the case. As far as we know, the level of these seas is as permanent as that of the ocean, and it is difficult to realize the existence of subterranean channels between it and the great ocean. Were there such a channel, the Dead Sea being the lower, it would be the recipient of ocean waters; and we cannot conceive how it should be such a recipient without ultimately rising to the level of its feeder.

66. It may be that the question suggested by my researches has no bearing upon the Dead Sea; that local elevations and subsidences alone were concerned in placing the level of its waters where it is. But is it probable that, throughout all the geological periods, during all the changes which have taken place in the distribution of land and water surface over the earth, the winds, which in the general channels of circulation pass over the Dead Sea, have alone been unchanged? Throughout all ages, periods, and formations, is it probable that the winds have just brought us as much moisture to that sea as they now bring, and have just taken up as much water from it as they now carry off? Obviously and clearly not. The salt-beds, the water-marks, the geological formations, and other facts traced by Nature's own hand upon the tablets of the rock—all indicate plainly enough that not only the Dead Sea, but the Caspian also, had upon them, in former periods, more abundant rains than they now have. Where did the vapor for those rains come from? and what has stopped the supply? Surely not the elevation or depression of the Dead Sea basin.

My researches with regard to the winds have suggested the probability (§ 19) that the vapor which is condensed into rains for the lake valley, and which the St. Lawrence carries off to the Atlantic Ocean, is taken up by the southeast trade-winds of the Pacific Ocean. Suppose this to be the case, and that the winds which bring this vapor arrive with it in the lake country at a mean dew-point of 50°. This would make the southwest winds the rain winds for the lakes generally, as well as for the Mississippi Valley; they are also, speaking generally, the rain winds of Europe, and, I have no doubt, of extra-tropical Asia.

67. Now suppose a certain mountain range, hundreds of miles to the southwest of the lakes, but across the path of these winds, were to be suddenly elevated, and its crest pushed up into the regions of snow, having a mean temperature of 30° Fahrenheit. The winds, in passing that range, would be subjected to a mean dew-point of 30°; and, not meeting with any more evaporating surface between such range and the lakes (§ 22), they would have no longer any moisture to deposit at the supposed lake temperature of 50°; they could not yield their moisture to anything above 30°. Consequently, the amount of precipitation in the lake country would fall off; the winds which feed the lakes would cease to bring as much water as the lakes now give to the St. Lawrence. In such a case, that river and the Niagara would drain them to the level of their bed; evaporation would be increased by reason of the dryness of the atmosphere and the want of rain, and the lakes would sink to that level at which, as in the case of the Caspian Sea, the precipitation and evaporation would finally become equal.

There is a self-regulating principle that would bring about this equality; for as the water in the lakes becomes lower, the area of its surface would be diminished, and the amount of vapor taken from it would

consequently become less and less as the surface was lowered, until the amount of water evaporated would become equal to the amount rained down again, precisely in the same way that the amount of water evaporated from the sea is exactly equal to the whole amount poured back into it by the rains, the fogs, and the dews.* Thus the great lakes of this continent would remain inland seas at a permanent level; the salt brought from the soil by the washings of the rivers and rains would cease to be taken off to the ocean as it now is; and finally, too, the great American lakes, in the process of ages, would become first brackish, and then briny.

Now, suppose the water basins which hold the lakes to be over a thousand fathoms (six thousand feet) deep. We know they are not more than four hundred and twenty feet deep; but suppose them to be six thousand feet deep. The process of evaporation, after the St. Lawrence had gone dry, might go on until one or two thousand feet or more were lost from the surface, and we should then have another instance of the level of an inland water-basin being far below the sea-level, as in the case of the Dead Sea; or it would become a rainless district, when the lakes themselves would go dry.

Or, let us take another case for illustration. Corallines are at work about the Gulf Stream; they have built up the Florida Reefs on one side, and the Bahama Banks on the other. Suppose they should build up a dam across the Florida Pass, and obstruct the Gulf Stream; and that, in like manner, they were to connect Cuba with Yucatan, by damming up the Yucatan Pass, so that the waters of the Atlantic should cease to flow into the Gulf. What should we have?

The depth of the marine basin which holds the waters of the Gulf is, in the deepest part, about a mile. The officers of the United States ship Albany have run a line of deep-sea soundings from west to east across the Gulf; the greatest depth they reported was about eight thousand feet. Subsequent experiments, however, induce the belief that the depth is not quite so great.

We should therefore have, by stopping up the channels between the Gulf and the Atlantic, not a sea-level in the Gulf, but we should have a mean level between evaporation and precipitation. If the former were in excess, the level of the Gulf waters would sink down until the surface exposed to the air would be just sufficient to return to the atmosphere, as vapor, the amount of water discharged by the rivers—the Mississippi and others—into the Gulf. As the waters were lowered, the extent of evaporating surface would grow less and less, until Nature should establish the proper ratio between the ability of the air to take up and the capacity of the rain to let down. Thus we might have a sea whose level would be much further below the water level of the ocean than is the Dead Sea.

68. There is still another process, besides the two already alluded to, by which the drainage of these inland basins may, through the agency of the sea winds, have been cut off from the great salt seas, and that is by the elevation of continents from the bottom of the sea in distant regions of the earth, and the substitution caused thereby of dry land instead of water for the winds to blow upon.

Now, suppose that a continent should rise up in that part of the ocean, wherever it may be, that

* The quantity of dew in England is about five inches during a year.—*Glaisher*.

supplies the clouds with the vapor that makes the rain for the hydrographic basin of the great American lakes. What would be the result? Why, surely, fewer clouds and less rain, which would involve a change of climate in the lake country; an increase of evaporation from it, because a decrease of precipitation upon it; and, consequently, a diminution of cloudy screens to protect the waters of the lakes from being sucked up by the rays of the sun; and consequently, too, there would follow a low stage for water-courses, and a lowering of the lake level would ensue.

So far, I have instanced these cases only hypothetically; but, both in regard to the hydrographical basins of the Mexican Gulf and American lakes, I have confined myself strictly to analogies. Mountain ranges have been upheaved across the course of the winds, and continents have been raised from the bottom of the sea; and, no doubt, the influence of such upheavals has been felt in remote regions by means of the winds, and the effects which a greater or less amount of moisture brought by them would produce.

In the case of the Salt Lake of Utah, we have an example of drainage that has been cut off, and an illustration of the process by which Nature equalizes the evaporation and precipitation. To do this, in this instance, she is salting up the basin which received the drainage of this inland water-shed. Here we have the appearance, I am told, of an old channel by which the water used to flow from this basin to the sea. Supposing there was such a time and such a watercourse, the water returned through it to the ocean was the amount by which the precipitation used to exceed the evaporation over the whole extent of country drained through this now dry bed of a river. The winds have had something to do with this; they are the agents which used to bring more moisture from the sea to this water-shed than they took away; and they are the agents which now carry off from that valley more moisture than is brought to it, and which, therefore, are making a salt-bed of places that used to be covered by water. In like manner, there is evidence that the great American lakes formerly had a drainage with the Gulf of Mexico. Steamers have been actually known, in former years, and in times of freshets, to pass from the Mississippi over into the lakes. At low water, the bed of a dry river can be traced between them. Now, the Salt Lake of Utah is to the southward and westward of our northern lake basin; that is, the quarter whence the rain winds have been supposed to come. May not the same cause which lessened the precipitation or increased the evaporation in the Salt Lake water-shed, have done the same for the water-shed of the great American system of lakes?

If the mountains to the west—the Sierra Nevada, for instance—stand higher now than they formerly did, and if the winds which fed the Salt Lake valley with precipitation had, as I suppose they have, to pass the summits of the mountains, it is easy to perceive why the winds should not convey as much vapor across them now as they did when the summit of the ranges was lower and not so cool.

69. The Andes, in the trade-wind region of South America, stand up so high, that the wind, in order to cross them, has to part with all its moisture (§ 29), and consequently there is, on the other side, a rainless region. Now, suppose a range of such mountains as these to be elevated across the track of the winds which supply the lake country with rains; it is easy to perceive how the whole country watered by the vapor which such winds bring, would be converted into a rainless region.

I have used these cases to illustrate a position which any philosopher, who considers the geological agency of the winds, may with propriety consult, when he is told of an inland basin, the water-level of which, it is evident, was once higher than it now is; and that position is that, though the evidences of a higher water-level be unmistakable and conclusive, it does not follow, therefore, that there has been a subsidence of the lake basin itself, or an upheaval of the water-shed drained by it.

The cause which has produced this change in the water-level, instead of being local and near, may be remote; it may have its seat in the obstructions which have been interposed in some other quarter of the world, which obstructions may prevent the winds from taking up or from bearing off their wonted supplies of moisture for the region whose water-level has been lowered.

Having therefore, I hope, made clear the meaning of the question proposed, by showing the manner in which winds may become important geological agents, and having explained how the upheaving of a mountain range in one part of the world may, through the winds, bear upon the physical geography of the sea, affect climates, and produce geological phenomena in another, I return to the Dead Sea and the great inland basins of Asia, and ask, How far is it possible for the elevation of the South American continent, and the upheaval of its mountains, to have had any effect upon the water-level of those seas? There are indications (§ 66) that they all once had a higher water-level than they now have, and that formerly the amount of precipitation was greater than it now is; then what has become of the sources of vapor? What has diminished its supply? Its supply would be diminished (§ 68) by the substitution of dry land in those parts of the ocean which used to supply that vapor; or the quantity of vapor deposited in the hydrographical basins of those seas would have been lessened if a snow-capped range of mountains (§ 67) had been elevated across the path of these winds, and between these basins and the places where they were supplied with vapor.

Now, if it be true (§ 21) that the trade-winds from the southern hemisphere take up the water which is to be rained in the extra-tropical north, the path (§ 11) ascribed to the southeast trades of Africa and America, after they descend and become the prevailing southwest winds of the northern hemisphere, should pass over a region of less precipitation generally than they would do if, while performing the office of southeast trades, they had blown over water instead of land. The southeast trade-winds, with their load of vapor, whether great or small, take, after ascending in the equatorial calms, a northeasterly direction; they continue to flow in the upper regions of the air in that direction until they cross the tropic of Cancer. The places of least rain, then, between this tropic and the pole, should be precisely those places which depend for their rains upon the vapor which the winds that blow over southeast trade-wind Africa and America convey.

Now, if we could trace the path of these winds through the extra-tropical regions of the northern hemisphere, we should be able to identify it by the foot-prints of the clouds; for the path of the winds which depend for their moisture upon such sources of supply as the dry land of Central South America and Africa cannot run through a country that is abundantly watered.

It is a remarkable *coincidence*, at least, that the countries in the extra-tropical regions of the north

that are situated to the northeast of the southeast trade-winds of South Africa and America—that the countries in our hemisphere, over which theory makes these winds to blow, include all the great deserts of Asia, and the districts of least precipitation in Europe. A line from the Gallipagos Islands, through Florence, in Italy, another from the mouth of the Amazon through Aleppo, in Holy Land (Plate IV.), would, after passing the tropic of Cancer, mark upon the surface of the earth the route of these winds; this is that "lee country" which, if such be the system of atmospherical circulation, ought to be scantily supplied with rains. Now the hyetographic map of Europe, in Johnston's beautiful *Physical Atlas*, places the region of least precipitation between these two lines (Plate IV.).

It would seem that Nature, as if to reclaim this "lee" land from the desert, had stationed by the way-side of these winds a succession of inland seas, to serve them as relays for supplying with moisture this thirsty air. There are the Mediterranean Sea, the Caspian Sea, and the Sea of Aral, all of which are situated exactly in this direction, as though these sheets of water were designed, in the grand system of aqueous arrangements, to supply with fresh vapor, winds that had already left rain enough behind them to make an Amazon and an Oronoco of.

70. Now that there has been such an elevation of land out of the water, we infer from the fact that the Andes were once covered by the sea, for their tops are now crowned with the remains of marine animals. When they and their continent were submerged—admitting that Europe in general outline was then as it now is—it cannot be supposed, if the circulation of vapor were then such as it is supposed now to be, that the climates of that part of the Old World which is under the lee of those mountains were then as scantily supplied with moisture as they now are. When the sea covered South America, the winds had nearly all the waters which now make the Amazon, to bring away with them and to distribute among the countries situated along the route (Plate IV.) ascribed to them.

If ever the Caspian Sea exposed a larger surface for evaporation than it now does—and no doubt it did; if the precipitation in that valley ever exceeded the evaporation from it, as it does in all valleys drained into the open sea, then there must have been a change of hygrometrical condition there. And admitting the vapor-springs for that valley to be situated in the direction supposed, the rising up of a continent from the bottom of the sea, or the upheaval of a range of mountains in certain parts of America, Africa, or Spain, across the route of the winds which brought the rain for the Caspian water-shed, might have been sufficient to rob them of the moisture which they were wont to carry away and precipitate upon this great inland basin. See how the Andes have made Atacama a desert, and of Western Peru a rainless country; these regions have been made rainless simply by the rising up of a mountain range between them and the vapor-springs in the ocean which feed with moisture the winds that blow over these now rainless regions.

That part of Asia, then, which is under the lee of southern trade-wind Africa, lies to the north of the tropic of Cancer, and between two lines, the one passing through Cape Palmas and Medina, the other through Aden and Delhi. Being extended to the equator, they will include that part of it which is crossed

by the continental southeast trade-winds of Africa, after they have traversed the greatest extent of land surface (Plate IV.).

The range which lies between the two lines that represent the course of the American winds with their vapors, and the two lines which represent the course of the African winds with their vapors, is the range which is under the lee of winds that have, for the most part, traversed water-surface, or the ocean, in their circuit as southeast trade-winds. But a bare inspection of Plate IV. will show that the southeast trade-winds which cross the equator between longitude 15° and 50° west, and which are supposed to blow over into this hemisphere between these two ranges, have traversed land as well as water; and the Trade-wind Chart shows that it is precisely those winds which, in the summer and fall, are converted into southwest monsoons for supplying the whole extent of Guinea with rains to make rivers of.* Those winds, therefore, it would seem, leave much of their moisture behind them, and pass along to their channels, in the grand system of circulation, for the most part as dry winds. Moreover, it is not to be supposed that the channels through which the winds blow that cross the equator at the several places named, are as sharply defined in nature as the lines suggested, or as Plate IV. would represent them to be.

The whole region of the extra-tropical Old World, that is included within the ranges marked, is the region which has most land to windward of it in the southern hemisphere. Now, it is a curious *coincidence*, at least, that all the great extra-tropical deserts of the earth, with those regions in Europe and Asia which have the least amount of precipitation upon them, should lie within this range. That they are situated under the lee of the southern continents, and have but little rain, may be a coincidence, I admit; but that these deserts of the Old World are placed where they are is no coincidence—no accident: they are placed where they are, and as they are, by design; and in being so placed, it was intended that they should subserve some grand purpose in the terrestrial economy. Let us see, therefore, if we can discover any marks of that design—any of the purposes of such an arrangement—and trace any connection between that arrangement and the supposition which I maintain as to the place where the winds that blow over those regions derive their vapors.

It will be remarked at once that all the inland seas of Asia, and all those of Europe, except the semi-fresh-water gulfs of the north, are within this range. The Persian Gulf and the Red Sea, the Mediterranean, the Black, and the Caspian, all fall within it. And why are they planted within it? Why are they arranged to the northeast and southwest under this lee, and in the very direction in which theory makes this breadth of thirsty winds to prevail? Clearly and obviously, one of the purposes in the Divine economy was, that they might replenish with vapor the winds which are almost vaporless when they arrive at these regions in the general system of circulation. And why should these winds be almost vaporless? They are almost vaporless because their route, in the general system of circulation, is such, that they are not brought into contact with the water-surface from which the needful supplies of vapor are to be had; or, being obtained, the supplies have since been taken away by the cool tops of mountain ranges over which these winds have had to pass.

In the Mediterranean, the evaporation is greater than the precipitation. Upon the Red Sea there

never falls a drop of rain; it is all evaporation. Are we not, therefore, entitled to regard the Red Sea as a make-weight, thrown in to regulate the proportion of cloud and sunshine, and to dispense rain to certain parts of the earth in due season and in proper quantities? Have we not, in these two facts, evidence conclusive that the winds which blow over these two seas come, for the most part, from a dry country—from regions which contain few or no pools to furnish supplies of vapor?

Indeed, so scantily supplied with vapor are the winds which pass in the general channels of circulation over the water-shed and sea-basin of the Mediterranean, that they take up there more water as vapor than they deposit. But, throwing out of the question what is taken up from the surface of the Mediterranean itself, these winds deposit more water on the water-shed whose drainage leads into that sea than they take up from it again. The excess is to be found in the rivers which discharge into the Mediterranean; but so thirsty are the winds which blow across the bosom of that sea, that they not only take up again all that those rivers pour into it, but they are supposed, by philosophers, to create a demand for an immense current from the Atlantic to supply the waste.

71. It is estimated that three* times as much water as the Mediterranean receives from its rivers is evaporated from its surface. This may be an over-estimate, but the fact that evaporation from it is in excess of the precipitation, is made obvious by the current which the Atlantic sends into it through the Straits of Gibraltar; and the difference, we may rest assured, whether it be much or little, is carried off to modify climate elsewhere—to refresh with showers and make fruitful some other part of the earth.

The great inland basin of Asia, in which are the Aral and Caspian Seas, is situated on the route which this hypothesis requires these thirsty winds from southeast trade-wind Africa and America to take; and so scant of vapor are these winds when they arrive in this basin, that they have no moisture to leave behind; just as much as they pour down they take up again and carry off. We know that the volume of water returned by the rivers, the rains, and the dews, into the whole ocean, is exactly equal to the volume which the whole ocean gives back to the atmosphere; as far as our knowledge extends, the level of each of these two seas is as permanent as that of the great ocean itself. Therefore, the volume of water discharged by rivers, the rains, and the dews, into these two seas, is exactly equal to the volume which these two seas give back as vapor to the atmosphere.

These winds, therefore, do not begin permanently to lay down their load of moisture, be it great or small, until they cross the Oural Mountains. On the steppes of Issam, after they have supplied the Amazon and the other great equatorial rivers of the south, we find them first beginning to lay down more moisture than they take up again. In the Obi, the Yenesi, and the Lena, is to be found the volume which contains the expression for the load of water which these winds have brought from the southern hemisphere, from the Mediterranean, and the Red Sea; for in these almost hyperborean river-basins do we find the first instance in which, throughout the entire range assigned these winds, they have, after supplying the Amazon, &c., left more water behind them than they have taken up again and carried off. The low

* *Vide* article "Physical Geography," Encyclopædia Britannica.

temperatures of Siberian Asia are quite sufficient to extract from these winds the remnants of vapor which the cool mountain tops and mighty rivers of the southern hemisphere have left in them.

Here I may be permitted to pause, that I may call attention to another remarkable coincidence, and admire the marks of design, the beautiful and exquisite adjustments that we see here provided, to insure the perfect workings of the great aqueous and atmospherical machine. This coincidence—may I not call it cause and effect?—is between the hygrometrical conditions of all the countries within, and the hygrometrical conditions of all the countries without the range included within the lines which I have drawn (Plate IV.) to represent the route in the northern hemisphere, of the southeast trade-winds *after* they have blown their course over the land in South Africa and America. Both to the right and left of this range are countries included between the same parallels in which it is, yet these countries all receive more water from the atmosphere than they give back to it again; they all have rivers running into the sea. On the one hand, there are in Europe the Rhine, the Elbe, and all the great rivers that empty into the Atlantic; on the other hand, there are in Asia the Ganges, and all the great rivers of China; and in North America, in the latitude of the Caspian Sea, is our great system of fresh-water lakes; all of these receive from the atmosphere immense volumes of water, and pour it back into the sea in streams the most magnificent.

It is remarkable that none of these copiously supplied water-sheds have, to the southwest of them in the trade-wind regions of the southern hemisphere, any considerable body of land; they are, all of them, under the lee of evaporating surfaces, of ocean waters in the trade-wind regions of the south. Only those countries in the extra-tropical north, which I have described as lying under the lee of trade-wind South America and Africa, are scantily supplied with rains.

72. The surface of the Caspian Sea is about equal to that of our lakes; in it, evaporation is just equal to the precipitation. Our lakes are between the same parallels, and about the same distance from the western coast of America that the Caspian Sea is from the western coast of Europe; and yet the waters discharged by the St. Lawrence give us an idea of how greatly the precipitation upon it is in excess of the evaporation. To windward of the lakes, and in the trade-wind regions of the southern hemisphere, is no land; but to windward of the Caspian Sea, and in the trade-wind region of the southern hemisphere, there is land. Therefore, supposing the course of the vapor-distributing winds to be such as I maintain it to be, ought they not to carry more water from the ocean to the American lakes than it is possible for them to carry from the land—from the interior of South Africa and America—to the valley of the Caspian Sea?

In like manner, extra-tropical New Holland and South Africa have each land—not water—to the windward of them in the trade-wind regions of the northern hemisphere, where, according to this hypothesis, the vapor for their rains ought to be taken up; they are both countries of little rain; but extra-tropical South America has, in the trade-wind region to windward of it in the northern hemisphere, a great extent of ocean, and the amount of precipitation in extra-tropical South America is wonderful. The coincidence, therefore, is remarkable, that the countries in the extra-tropical regions of this hemisphere, which lie to the northeast of large districts of land in the trade-wind regions of the other hemisphere, should be scantily supplied with rains; and, likewise, that those so situated in the extra-tropical south, with regard to land in the trade-wind region of the north, should be scantily supplied with rains.

Having thus remarked upon the coincidence, let us turn to the evidences of design, and contemplate the beautiful harmony displayed in the arrangement of the land and water, as we find them along this conjectural "wind-road." (Plate IV.)

Those who admit design among terrestrial adaptations, or have studied the economy of cosmical arrangements, will not be loth to grant that by design the atmosphere keeps in circulation a certain amount of moisture; that the water of which this moisture is made is supplied by the aqueous surface of the earth, and that it is to be returned to the seas again through rivers and the process of precipitation; that a permanent increase or decrease of the quantity of water thus put and kept in circulation by the winds would be followed by a corresponding change of hygrometrical conditions, which would draw after it permanent changes of climate; and that permanent changes of climate would involve the ultimate well-being of myriads of organisms, both in the vegetable and animal kingdoms.

73. The quantity of moisture that the atmosphere keeps in circulation is, no doubt, just that quantity which is best suited to the well-being, and most adapted to the proper development of the vegetable and animal kingdoms; and that quantity is dependent upon the arrangement and the proportions that we see in nature between the land and the water—between mountain and desert, river and sea. If the seas and evaporating surfaces were changed, and removed from the places they occupy to other places, the principal places of precipitation probably would also be changed; whole families of plants would wither and die for want of cloud and sunshine, dry and wet, in proper proportions and in due season; and, with the blight of plants, whole tribes of animals would also perish. Under such a chance arrangement, man would no longer be able to rely upon the early and the latter rain, or to count with certainty upon the rains being sent in due season for seed-time and harvest. And that the rain will be sent in due season, we are assured from on high; and when we recollect who it is that "sendeth" it, we feel the conviction strong within us that He that sendeth the rain has the winds for his messengers; and that they may do his bidding, the land and the sea were arranged, both as to position and relative proportions, where they are, and as they are.

It should be borne in mind that the southeast trade-winds, after they rise up at the equator (Plate XVIII.), have to overleap the northeast trade-winds. Consequently, they do not touch the earth until near the tropic of Cancer (see the bearded arrows, Plate IV.), more frequently to the north than to the south of it; but for a part of every year, the place where these vaulting southeast trades first strike the earth, after leaving the other hemisphere, is very near this tropic. On the equatorial side of it, be it remembered, the northeast trade-winds blow; on the polar side, what were the southeast trades, and what are now the prevailing southwesterly winds of our hemisphere, prevail. Now examine Plate IV., and it will be seen that the upper half of the Red Sea is north of the tropic of Cancer; the lower half is to the south of it; that the latter is within the northeast trade-wind region; the former, in the region where the southwest passage winds are the prevailing winds.

74. The river Tigris is probably evaporated from the upper half of this sea by these winds; while the northeast trade-winds take up from the lower half those vapors which feed the Nile with rain, and which the clouds deliver to the cold demands of the Mountains of the Moon. Thus there are two "wind-

roads" crossing this sea; to the windward of it, each road runs through a rainless region; to the leeward, there is, in each case, a river to cross.

The Persian Gulf lies, for the most part, in the track of the southwest winds; to the windward of the Persian Gulf is a desert; to the leeward, the river Indus. This is the route by which theory would require the vapor from the Red Sea and Persian Gulf to be conveyed; and this is the direction in which we find indications that it is conveyed. For to leeward do we find, in each case, a river, telling to us, by signs not to be mistaken, that it receives more water from the clouds than it gives back to the winds.

Is it not a curious circumstance, that the winds which travel the road suggested from the southern hemisphere should, when they touched the earth on the polar side of the tropic of Cancer, be so thirsty, more thirsty, much more, than those which travel on either side of their path, and which are supposed to have come from southern seas, not from southern lands?

The Mediterranean has to give those winds three times as much vapor as it receives from them (§ 71); the Red Sea gives them as much as they can take, and receives nothing back in return but a little dew; the Persian Gulf also gives more than it receives. What becomes of the rest? Doubtless it is given to the winds, that they may bear it off to distant regions, and make lands fruitful, that, but for these sources of supply, would be almost rainless, if not entirely arid, waste, and barren.

These seas and arms of the ocean now present themselves to the mind as counterpoises in the great hygrometrical machinery of our planet. As sheets of water placed where they are to balance the land in the trade-wind region of South America and South Africa, they now present themselves. When the foundations of the earth were laid, we know who it was that "measured the waters in the hollow of his hand, and meted out the heavens with a span, and comprehended the dust of the earth in a measure, and weighed the mountains in scales, and the hills in a balance." And hence we know also that they are arranged both according to proportion and to place.

Here, then, we see harmony in the winds, design in the mountains, order in the sea, arrangement in the dust, and form for the desert. Here are signs of beauty and works of grandeur; and we may now fancy that, in this exquisite system of adaptations and compensations, we can almost behold, in the Red and Mediterranean Seas, the very waters that were held in the hollow of the Almighty hand when he weighed the Andes of America, and balanced the hills of Africa in his comprehensive scales.

In that great inland basin of Asia which holds the Caspian Sea, and embraces an area of one million and a half of geographical square miles, we see the water-surface so exquisitely adjusted that it is just sufficient, and no more, to return to the atmosphere as vapor exactly as much moisture as the atmosphere lends, in rain, to the rivers of that basin.

Thus we are entitled to regard the Mediterranean, the Red Sea, and Persian Gulf as relays, distributed along the route of these thirsty winds from the continents of the other hemisphere, to supply them with vapors, or to restore to them that which they have left behind to feed the sources of the Amazon, the Niger, and the Congo.

The hypothesis that the winds from South Africa and America do take the course through Europe

and Asia which I have marked out for them (Plate IV.), is supported by so many coincidences, to say the least, that we are entitled to regard it as probably correct, until a train of coincidences as striking can be adduced to show that such is not the case.

Returning once more to a consideration of the geological agency of the winds in accounting for the depression of the Dead Sea, we now see the fact most strikingly brought out before us, that if the Straits of Gibraltar were to be barred up, so that no water could pass through them, we should have a great depression of water-level in the Mediterranean. Three times as much water is evaporated from that sea as is returned to it through the rivers. A portion of water evaporated from it is probably rained down and returned to it through the rivers; but—supposing it to be barred up—as the demand upon it for vapor would exceed the supply by rains and rivers, it would commence to dry up. As it sinks down, the area exposed for evaporation would decrease, and the supplies to the rivers would diminish, until finally there would be established between the evaporation and precipitation an equilibrium, as in the Dead and Caspian Seas; but, for aught we know, the water-level of the Mediterranean might, before this equilibrium were attained, have reached a stage far below that of the Dead Sea level.

The Lake Tadjura is now in the act of attaining such an equilibrium. There are connected with it the remains of a channel by which the water ran into the sea; but the surface of the lake is now five hundred feet below the sea-level, and it is salting up. If not in the Dead Sea, do we not, in the valley of this lake, find outcropping some reason for the question, What have the winds had to do with the phenomena before us?

The winds, in this sense, are geological agents of great power. It is not impossible but that they may afford us the means of comparing, directly, geological events which had taken place in one hemisphere, with geological events in another: *e. g.* the tops of the Andes were once at the bottom of the sea. Which is the oldest formation, that of the Dead Sea or the Andes? If the former be the older, then the climate of the Dead Sea must have been hygrometrically very different from what it now is.

In regarding the winds as geological agents, we can no longer consider them as the type of instability. We rather behold them now in the light of ancient and faithful chroniclers, which, upon being rightly consulted, will reveal to us truths which Nature has written upon their wings in characters as legible and enduring as she has ever engraved the history of geological events upon the tablet of the rock.

75. The waters of Lake Titicaca, which receives the drainage of the great inland basin of the Andes, are only brackish, not salt. Hence we may infer that this lake has not been standing long enough to become brine, like the waters of the Dead Sea; consequently, it belongs to a more recent period. On the other hand, it will also be interesting to hear that my friend, Captain Lynch, informs me that, in his exploration of the Dead Sea, he saw what he took to be the dry bed of a river that once flowed from it. And thus we have two more links, stout and strong, to add to the circumstantial evidence going to sustain the testimony of this strange and fickle witness, which I have called up from the sea to testify in this presence concerning the works of Nature, and to tell us which be the older, the hoary-headed Andes, watching the stars, or the Dead Sea, sleeping upon its ancient beds of crystal salt.

CHAPTER V.

THE EQUATORIAL CLOUD-RING.*

Equatorial Doldrums, § 76.—The Offices performed by Clouds in the terrestrial Economy, 78.—The Barometer and Thermometer under the Cloud-ring, 79.—How its Vapors are brought by the Trade-Winds, 81.—Breadth of the Cloud-ring, 82.—How it would appear if seen from one of the Planets, 83.—Observations at Sea interesting, 84.

76. SEAFARING people have, as if by common consent, divided the ocean off into regions, and characterized them according to the winds: *e. g.* there are the trade-wind regions, the variables, the horse latitudes, the "doldrums," &c. The "horse latitudes" are the belts of calms and light airs (§ 7) which border the polar edge of the northeast trades. They were so called from the circumstance that vessels formerly bound from New England to the West Indies, with a deck load of horses, were often so delayed in this calm belt of Cancer, that, for the want of water for their animals, they were compelled to throw a portion of them overboard.

The equatorial doldrums is another of these calm places (§ 9). Besides being a region of calms and baffling winds, it is a region noted for its rains and clouds, which make it one of the most oppressive and disagreeable places at sea. The emigrant ships from Europe for Australia have to cross it. They are often baffled in it for two or three weeks; then the children and the passengers who are of delicate health suffer most. It is a frightful graveyard on the way-side to that golden land.

77. A vessel bound into the southern hemisphere from Europe or America, after clearing the region of variable winds and crossing the "horse latitudes," enters the northeast trades. Here the mariner finds the sky sometimes mottled with clouds, but for the most part clear. Here, too, he finds his barometer rising and falling under the ebb and flow of a regular atmospherical tide, which gives a high and low barometer every day, with such regularity, that the time of day within a few minutes may be told by it. The rise and fall of this tide, measured by the barometer, amounts to about one-tenth (0.1) of an inch, and it occurs daily, and everywhere between the tropics; the maximum about 10h. 30m. A. M., the minimum between 4h. and 5h. P. M., with a second maximum and minimum about 10 P. M. and 5 A. M.† The diurnal variation of the needle changes also with the turning of these invisible tides. Continuing his course toward the equinoctial line, he observes his thermometer to rise higher and higher as he approaches it; at last, entering the region of equatorial calms and rains, he feels the weather to become singularly close and oppressive; he discovers here that the elasticity of feeling which he breathed from the trade-wind air has forsaken him; he has entered the doldrums, and is under the "cloud-ring."

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* *Vide* Maury's Physical Geography of the Sea.

† See paper on Meteorological Observations in India, by Colonel Sykes, Philosophical Transactions for 1850, Part II. p. 297.

Escaping from this gloomy region, and entering the southeast trades beyond, his spirits revive, and he turns to his log-book to see what changes are recorded there. He is surprised to find that, notwithstanding the oppressive weather of the rainy latitudes, both his thermometer and barometer stood, while in them, lower than in the clear weather on either side of them; that just before entering and just after leaving the rainy parallels, the mercury of the thermometer and barometer invariably stands higher than it does when within them, even though they include the equator. In crossing the equatorial doldrums, he has passed a ring of clouds that encircles the earth.

I find in the journal of the late Commodore Arthur Sinclair, kept on board the United States frigate Congress during a cruise to South America in 1817–18, a picture of the weather under this *cloud-ring* that is singularly graphic and striking. He encountered it in the month of January, 1818, between the parallel of 4° north and the equator, and between the meridians of 19° and 23° west. He says of it:—

"This is certainly one of the most unpleasant regions in our globe. A dense, close atmosphere, except for a few hours after a thunder-storm, during which time torrents of rain fall, when the air becomes a little refreshed; but a hot, glowing sun soon heats it again, and but for your awnings, and the little air put in circulation by the continual flapping of the ship's sails, it would be almost insufferable. No person who has not crossed this region can form an adequate idea of its unpleasant effects. You feel a degree of lassitude unconquerable, which not even the sea-bathing, which everywhere else proves so salutary and renovating, can dispel. Except when in actual danger of shipwreck, I never spent twelve more disagreeable days, in the professional part of my life, than in these calm latitudes.

"I crossed the line on the 17th of January, at eight A. M., in longitude 21° 20′, and soon found I had surmounted all the difficulties consequent to that event; that the breeze continued to freshen and draw round to the south-southeast, bringing with it a clear sky and most heavenly temperature, renovating and refreshing beyond description. Nothing was now to be seen but cheerful countenances, exchanged, as by enchantment, from that sleepy sluggishness which had borne us all down for the last two weeks."

78. One need not go to sea to perceive the grand work which the clouds perform in collecting moisture from the crystal vaults of the sky, in sprinkling it upon the fields, and making the hills glad with showers of rain. Winter and summer, "the clouds drop fatness upon the earth." This part of their office is obvious to all, and I do not propose to consider it now. But the sailor at sea observes phenomena and witnesses operations in the terrestrial economy which tell him that, in the beautiful and exquisite adjustments of the grand machinery of the atmosphere, the clouds have other important offices to perform besides those merely of dispensing showers, of producing the rains, and of weaving mantles of snow for the protection of our fields in winter. As important as are these offices, the philosophical mariner, as he changes his sky, is reminded that the clouds have commandments to fulfil, which, though less obvious, are not therefore the less benign in their influences, or the less worthy of his notice. He beholds them at work in moderating the extremes of heat and cold, and in mitigating climates. At one time they spread themselves out; they cover the earth as with a mantle; they prevent radiation from its crust, and keep it warm. At another time, they interpose between it and the sun; they screen it from his scorching rays,

and protect the tender plants from his heat, the land from the drought; or, like a garment, they overshadow the sea, defending its waters from the intense forces of evaporation. Having performed these offices for one place, they are evaporated and given up to the sunbeam and the winds again, to be borne on their wings away to other places which stand in need of like offices.

Familiar with clouds and sunshine, the storm and the calm, and all the phenomena which find expression in the physical geography of the sea, the right-minded mariner, as he contemplates "the cloud without rain," ceases to regard it as an empty thing; he perceives that it performs many important offices; he regards it as a great moderator of heat and cold—as a "compensation" in the atmospherical mechanism, which makes the performance of the grand machine perfect.

Marvellous are the offices and wonderful is the constitution of the atmosphere. Indeed, I know of no subject more fit for profitable thought on the part of the truth-loving, knowledge-seeking-student, be he seaman or landsman, than that afforded by the atmosphere and its offices. Of all parts of the physical machinery, of all the contrivances in the mechanism of the universe, the atmosphere, with its offices and its adaptations, appears to me to be the most wonderful, sublime, and beautiful. In its construction, the perfection of knowledge is involved. The perfect man of Uz, in a moment of inspiration, thus demands of his comforters: "But where shall wisdom be found, and where is the place of understanding? The depth saith, It is not in me; and the sea saith, It is not with me. It cannot be gotten for gold, neither shall silver be weighed for the price thereof. No mention shall be made of coral or of pearls, for the price of wisdom is above rubies.

"Whence, then, cometh wisdom, and where is the place of understanding? Destruction and Death say, We have heard the fame thereof with our ears.

"God understandeth the way thereof, and he knoweth the place thereof; for he looketh to the ends of the earth, and seeth under the whole heaven; *to make the weight for the winds;* and he weigheth the waters by measure. When he made a decree for the rain, and a way for the lightning of the thunder; then did he see it, and declare it; he prepared it, yea, and searched it out."*

When the pump-maker came to ask Galileo to explain how it was that his pump would not lift water higher than thirty-two feet, the philosopher thought, but was afraid to say, it was owing to the "weight of the winds;" and though the fact that the air has weight is here so distinctly announced, philosophers never knew it until within comparatively a recent period, and then it was proclaimed by them as a great discovery. Nevertheless, the fact was set forth as distinctly in the book of Nature as it is in the book of Revelation; for the infant, in availing itself of atmospherical pressure to suck the milk from its mother's breast, unconsciously proclaimed it.

79. Both the thermometer and the barometer (§ 77) stand lower under this cloud-ring than they do on either side of it. After having crossed it, and referred to the log-book to refresh his mind as to the observations there entered with regard to it, the attentive navigator may perceive how this belt of

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* Job, chapter xxviii.

clouds, by screening the parallels over which he may have found it to hang, from the sun's rays, not only promotes the precipitation which takes place within these parallels at certain periods, but how, also, the rains are made to change the places upon which they are to fall; and how, by travelling with the calm belt of the equator up and down the earth, this cloud-ring shifts the surface from which the heating rays of the sun are to be excluded; and how, by this operation, tone is given to the atmospherical circulation of the world, and vigor to its vegetation.

Having travelled with the calm belt to the north or south, the cloud-ring leaves the sky about the equator clear; the rays of the torrid sun pour down upon the crust of the earth there, and raise its temperature to a scorching heat. The atmosphere dances, and the air is seen trembling in ascending and descending columns, with busy eagerness to conduct the heat off and deliver it to the regions aloft, where it is required to give momentum to the air in its general channels of circulation. The dry season continues; the sun is vertical; and, finally, the earth becomes parched and dry; the heat accumulates faster than the air can carry it away; the plants begin to wither, and the animals to perish. Then comes the mitigating cloud-ring. The burning rays of the sun are intercepted by it. The place for the absorption and reflection, and the delivery to the atmosphere of the solar heat, is changed; it is transferred from the upper surface of the earth to the upper surface of the clouds.

Radiation from the land and the sea below the cloud-belt is thus interrupted, and the excess of heat in the earth is delivered to the air, and by absorption carried up to the clouds, and there transferred to their vapors to prevent excess of precipitation.

In the mean time, the trade-winds north and south are pouring into this cloud-covered receiver, as the calm and rain-belt of the equator may be called, fresh supplies in the shape of ceaseless volumes of heated air loaded to saturation with vapor, which has to rise above and get clear of the clouds before it can commence the process of cooling by radiation. In the mean time, also, the vapors which the trade-winds bring from the north and the south, expanding and growing cooler as they ascend, are being condensed on the lower side of the cloud stratum, and their latent heat is set free, to check precipitation and prevent a flood.

While this process and these operations are going on upon the nether side of the cloud-ring, one not less important is going on upon the upper side. There, from sunrise to sunset, the rays of the sun are pouring down without intermission. Every day and all day long, they operate with ceaseless activity upon the upper surface of the cloud stratum. When they become too powerful, and convey more heat to the cloud vapors than the cloud vapors can reflect and give off to the air above them, then, with a beautiful elasticity of character, the clouds absorb the surplus heat. They melt away, become invisible, and retain, in a latent and harmless state, until it is wanted at some other place and on some other occasion, the heat thus imparted.

We thus have an insight into the operations which are going on in the equatorial belt of precipitation, and this insight is sufficient to enable us to perceive that exquisite indeed are the arrangements which Nature has provided for supplying this calm belt with heat, and for pushing the snow-line there high up

above the clouds, in order that the atmosphere may have room to expand, to rise up, overflow, and course back into its channels of healthful circulation. As the vapor is condensed and formed into drops of rain, a twofold object is accomplished—coming from the cooler regions of the clouds, the rain-drops are cooler than the air and earth below; they descend, and by absorption take up the heat which has been accumulating in the earth's crust during the dry season, and which cannot now escape by radiation. Thus this cloud-ring modifies the climate of all places beneath it; overshadowing, at different seasons, all parallels from 5° south to 15° north.

In the process of condensation, these rain-drops, on the other hand, have set free a vast quantity of latent heat, which has been gathered up with the vapor from the sea by the trade-winds and brought hither. The caloric thus liberated is taken by the air and carried up aloft still further, to keep, at the proper distance from the earth, the line of perpetual congelation. Were it possible to trace a thermal curve in the upper regions of the air to represent this line, we should no doubt find it mounting sometimes at the equator, sometimes on this side, and sometimes on that of it, but always so mounting as to overleap this cloud-ring. This thermal line would not ascend always over the same parallels: it would ascend over those between which this ring happens to be; and the distance of this ring from the equator is regulated according to the seasons.

If we imagine the atmospherical equator to be always where the calm belt is which separates the northeast from the southeast trade-winds, then the loop in the thermal curve, which should represent the line of perpetual congelation in the air, would be always found to stride this equator; and it may be supposed that a thermometer, kept sliding on the surface of the earth so as always to be in the middle of this rain-belt, would show very nearly the same temperature all the year round; and so, too, would a barometer the same pressure.

80. Returning, and taking up the train of contemplation as to the office which this belt of clouds, as it encircles the earth, performs in the system of oceanic adaptations, we may see that the cloud-ring and calm zone which it overshadows perform the office both of ventricle and auricle in the immense atmospherical heart, where the heat and the forces which give vitality and power to the system are brought into play—where dynamical strength is gathered, and an impulse given to the air sufficient to send it thence through its long and tortuous channels of circulation.

Thus this ring, or band, or belt of clouds, is stretched around our planet to regulate the quantity of precipitation in the rain-belt beneath it; to preserve the due quantum of heat on the face of the earth; to adjust the winds; and send out for distribution to the four corners, vapors in proper quantities to make up to each river-basin, climate, and season, its quota of sunshine, cloud, and moisture. Like the balance-wheel of a well-constructed chronometer, this cloud-ring affords the grand atmospherical machine the most exquisitely arranged *self-compensation.* If the sun fail in his supply of heat to this region, more of its vapors are condensed, and heat is discharged from its latent store-houses in quantities just sufficient to keep the machine in the most perfect compensation. If, on the other hand, too much heat be found to accompany the rays of the sun, as they impinge upon the upper circumference of this belt, then, again, on

that side, are the means of self-compensation ready at hand; so much of the cloud-surface as may be requisite is then resolved into invisible vapor—the vessels wherein the surplus heat from the sun is stored away and held in the latent state until it is called for—when instantly it is set free, and becomes an obvious and active agent in the grand design.

That the thermometer stands *invariably* lower (§ 79) beneath this cloud-belt than it does on either side of it, has not, so far as my researches are concerned, been made to appear by actual observation, for the observations in my possession have not yet been *fully* discussed concerning the temperature of the air. But that the temperature of the air at the surface under this cloud-ring is lower, is a theoretical deduction as susceptible of demonstration as is the rotation of the earth on its axis. Indeed, Nature herself has hung a thermometer under this cloud-belt that is more perfect than any that man can construct, and its indications are not to be mistaken.

81. Where do the vapors which form this cloud-ring, and which are here condensed and poured down into the sea as rain, come from? They come from the trade-wind regions (§ 15); under the cloud-ring they rise up; as they rise up, they expand; and as they expand, they grow cool, form clouds, then are condensed into rains; moreover, it requires no mercurial instrument of human device to satisfy us that the air which brings the vapor for these clouds cannot take it up and let it down at the same temperature. Precipitation and evaporation are the converse of each other; and the same air cannot precipitate and evaporate, take up and let down water, at one and the same temperature. As the temperature of the air is raised, its capacity for receiving and retaining water in the state of vapor is increased; as the temperature of the air is lessened, its capacity for retaining that moisture is diminished. These are physical laws, and therefore, when we see water dripping from the atmosphere, we need no instrument to tell us that the elasticity of the vapor so condensed, and falling in drops, is less than was its elasticity when it was taken up from the surface of the ocean as water, and went up into the clouds as vapor.

Hence we infer that, when the vapors of sea water are condensed, the heat which was necessary to sustain them in the vapor state, and which was borrowed from the ocean, is parted with, and that therefore they were subjected, in the act of condensation, to a lower temperature than they were in the act of evaporation. Ceaseless precipitation goes on under this cloud-ring. Evaporation under it is suspended almost entirely. We know that the trade-winds encircle the earth; that they blow perpetually; that they come from the north and the south, and meet each other near the equator; therefore we infer that this line of meeting extends around the world. By the rainy seasons of the torrid zone we can trace the declination of this cloud-ring stretched like a girdle round about the earth; it travels up and down the ocean as from north to south and back.

82. It is broader than the belt of calms out of which it rises. As the air, with its vapors, rises up in this calm belt and ascends, these vapors are condensed into clouds (§ 81), and this condensation is followed by a turgid intumescence, which causes the clouds to overflow the calm belt, as it were, both to the north and the south. The air flowing off in the same direction assumes the character of winds that form the upper currents that are counter (Plate II.) to the trade-winds. These currents carry the clouds still further

to the north and south, and thus make the cloud-ring broader. At least, we infer such to be the case, for the rains are found to extend out into the trade-winds, and often to a considerable distance both to the north and the south of the calm belt.

83. Were this cloud-ring luminous, and could it be seen by an observer from one of the planets, it would present to him an appearance not unlike the rings of Saturn do to us. Such an observer would remark that this cloud-ring of the earth has a motion contrary to that of the axis of our planet itself—that while the earth was revolving rapidly from west to east, he would observe the cloud-ring to go slowly, but only relatively, from east to west. As the winds which bring the cloud-vapor to this region of calms rise up with it, the earth is slipping from under them; and thus the cloud-ring, though really moving from west to east with the earth, goes relatively slower than the earth, and would therefore appear to require a longer time to complete a revolution.

But, unlike the rings of Saturn through the telescope, the outer surface, or the upper side to us, of this cloud-ring would appear exceedingly jagged, rough, and uneven.

The rays of the sun, playing upon this peak and then upon that of the upper cloud-surface, melt away one set of elevations and create another set of depressions. The whole stratum is, it may be imagined, in the most turgid state; it is in continued throes when viewed from above; the heat which is liberated from below in the process of condensation, the currents of warm air ascending from the earth, and of cool descending from the sky, all, we may well conceive, tend to keep the upper cloud-surface in a perpetual state of agitation, upheaval, and depression.

Imagine, in such a cloud-stratum, an electrical discharge to take place; the report, being caught up by the cloud-ridges above, is passed from peak to peak, and repeated from valley to valley, until the last echo dies away in the mutterings of the distant thunder. How often do we hear the voice of the loud thunder rumbling and rolling away above the cloud-surface, like the echo of artillery discharged among the hills!

Hence we perceive or infer that the clouds intercept the progress of sound, as well as of light and heat, through the atmosphere, and that this upper surface is often like Alpine regions, which echo back and roll along with rumbling noise the mutterings of the distant thunder.

84. It is by trains of reasoning like this that we are continually reminded of the interest which attaches to the observations which the mariner is called on to make. There is no expression uttered by Nature which is unworthy of our most attentive consideration—for no physical fact is too bald for observation—and mariners, by registering in their logs the kind of lightning, whether sheet, forked, or streaked, and the kind of thunder, whether rolling, muttering, or sharp, may be furnishing facts which will throw much light on the features and character of the clouds in different latitudes and seasons. Physical facts are the language of Nature, and every expression uttered by her is worthy of our most attentive consideration.

CHAPTER VI.

THE SALTS OF THE SEA.*

What the Salt in Sea Water has to do with Currents, § 85.—Coral Islands, 87.—What would be the Effect of no System of Circulation for Sea Water? 88.—Its Components, 89.—The principal Agents from which Dynamical Force in the Sea is derived, 90.—Sea and Fresh Water have different Laws of Expansion, 95.—The Gulf Stream could not exist in a Sea of Fresh Water, 96.—The Effect of Evaporation in producing Currents, 97.—How the Polar Sea is supplied with Salt, 101.—The Influence of under Currents upon open Water in the Frozen Ocean, 102.—The Influence exerted by Shell-fish upon Currents, 103.—They assist in regulating Climates, 104.—How Sea Shells and Salts act as Compensations in the Machinery by which Oceanic Circulation is conducted, 105. —Whence come the Salts of the Sea? 106.

85. In order to comprehend aright the currents of the sea, and to study with advantage its physical adaptations, it is necessary to understand the effects produced by the salts of the sea upon the equilibrium of its waters; for wherever equilibrium be destroyed, whether in the air or water, it is restored by motion, and motion among fluid particles gives rise to currents, which, in turn, constitute circulation.

The question is often asked, "Why is the sea salt?" I think it can be shown that the circulation of the ocean depends, in a great measure, upon the salts of sea water; certainly its influences upon climate are greatly extended by reason of its saltness.

As a general rule, the sea is nearly of a uniform degree of saltness, and the constituents of sea water are as constant in their proportions as are the components of the atmosphere. It is true that we sometimes come across arms of the sea, or places in the ocean, where we find the water more salt or less salt than sea water is generally; but this circumstance is due to local causes of easy explanation. For instance, when we come to an arm of the sea, as the Red Sea, upon which it never rains, and from which the atmosphere is continually abstracting, by evaporation, fresh water from the salt, we may naturally expect to find a greater proportion of salt in the sea water that remains than we do near the mouth of some great river, as the Amazon, or in the regions of constant precipitation, or other parts where it rains more than it evaporates. Therefore we do not find sea water from all parts of the ocean actually of the same degree of saltness, yet we do find, as in the case of the Red Sea, sea water that is continually giving off to evaporation fresh water in large quantities: nevertheless, for such water there is a degree, and a very moderate degree, of saltness which is a maximum; and we moreover find that, though the constituents of sea water, like those of the atmosphere, are not for every place invariably the same as to their proportions, yet they are the same, or nearly the same, as to their character.

When, therefore, we take into consideration the fact that, as a general rule, sea water is, with the

* *Vide* Maury's Physical Geography of the Sea. Harper and Brothers, New York.

exceptions above stated, everywhere and always the same, and that it can only be made so by being well shaken together, we find grounds on which to base the conjecture that the ocean has its system of circulation, which is probably as complete and not less wonderful than is the circulation of blood through the human system.

In order to investigate the currents of the sea, and to catch a glimpse of the laws by which the circulation of its waters is governed, hypothesis, in the present meagre state of absolute knowledge with regard to the subject, seems to be as necessary to progress as is a corner-stone to a building. To make progress with such investigations, we want something to build upon. In the absence of facts, we are sometimes permitted to suppose them; only, in supposing them, we should take not only the possible, but the probable; and in making the selection of the various hypotheses which are suggested, we are bound to prefer that one by which the greatest number of phenomena can be reconciled. When we have found, tried, and offered such an one, we are entitled to claim for it a respectful consideration, at least until we discover it leading us into some palpable absurdity, or until some other hypothesis be suggested which will account equally as well, but for a greater number of phenomena. Then, as honest searchers after truth, we should be ready to give up the former, to adopt the latter, and to try it until some other, better than either of the two, be offered.

86. With this understanding, I venture to offer an hypothesis with regard to the agency of the salts or solid matter of the sea in imparting dynamical force to the waters of the ocean, and to suggest that one of the purposes which, in the grand design, it was probably intended to accomplish by having the sea salt, and not fresh, was to impart to its waters the forces and powers necessary to make their circulation complete.

In the first place, we do but conjecture when we say that there is a set of currents in the sea by which its waters are conveyed from place to place with regularity, certainty, and order. But this conjecture appears to be founded on reason; for if we take a sample of water which shall fairly represent, in the proportion of its constituents, the average water of the Pacific Ocean, and analyze it, and if we do the same by a similar sample from the Atlantic, we shall find the analysis of the one to resemble that of the other as closely as though the two samples had been taken from the same bottle after having been well shaken. How, then, shall we account for this, unless upon the supposition that sea water from one part of the world is, in the process of time, brought into contact and mixed up with sea water from all other parts of the world? Agents, therefore, it would seem, are at work, which shake up the waters of the sea as though they were in a bottle, and which, in the course of time, mingle those that are in one part of the ocean with those that are in another as thoroughly and completely as it is possible for man to do in a vessel of his own construction.

This fact, as to uniformity of components, appears to call for the hypothesis that sea water which to-day is in one part of the ocean, will, in the process of time, be found in another part the most remote. It must, therefore, be carried about by currents; and as these currents have their offices to perform in the terrestrial economy, they probably do not flow by chance, but in obedience to physical laws; they no

doubt, therefore, maintain the order and preserve the harmony which characterize every department of God's handiwork, upon the threshold of which man has as yet been permitted to stand, to observe, and to comprehend.

87. Nay, having reached this threshold, and taken a survey of the surrounding ocean, we are ready to assert, with all the confidence of knowledge, that the sea has a system of circulation for its waters. We rest this assertion upon our faith in the physical adaptations with which the sea is invested. Take, for example, the coral islands, reefs, beds, and atolls with which the Pacific Ocean is studded and garnished. They were built up of materials which a certain kind of insect quarried from the sea water. The currents of the sea ministered to this little insect—they were its *hod carriers;* when fresh supplies of solid matter were wanted for the coral rock upon which the foundations of the Polynesian Islands were laid, they brought them; the obedient currents stood ready with fresh supplies in unfailing streams of sea water from which the solid ingredients had not been secreted. Now, unless the currents of the sea had been employed to carry off from this insect the waters that had been emptied by it of their lime, and to bring to it others charged with more, it is evident the little creature would have perished for want of food long before its task was half completed. But for currents, it would have been impaled in a nook of the very drop of water in which it was spawned; for it would have soon secreted the lime contained in this drop of water, and then, without the ministering aid of currents to bring it more, it would have perished for the want of food for itself and materials for its edifice; and thus, but for the benign currents which took this exhausted water away, there we perceive this emptied drop would have remained, not only as the grave of the little architect, but as a monument in attestation of the shocking monstrosity that there had been a failure in the sublime system of terrestrial adaptations—that the sea had not been adapted by its Creator to the well-being of all its inhabitants. Now we do know that its adaptations are suited to all the wants of every one of its inhabitants—to the wants of the coral insect as well as to those of the whale. Hence we say *we know* that the sea has its system of circulation, for it transports materials for the coral rock from one part of the world to another; its currents receive them from the rivers, and hand them over to the little mason for the structure of the most stupendous works of solid masonry that man has ever seen—the coral islands of the sea.

And thus, by a process of reasoning which is perfectly philosophical, we are irresistibly led to conjecture that there are regular and certain, if not appointed channels, through which the water travels from one part of the ocean to another, and that those channels belong to an arrangement which may make, and, for aught we know to the contrary, which does make the system of oceanic circulation as complete, as perfect, and as harmonious as is that of the atmosphere or the blood. Every drop of water in the sea is as obedient to law and order as are the members of the heavenly host in the remotest regions of space. For when the morning stars sang together, "the waves also lifted up their voice" in the almighty anthem; and doubtless, therefore, the harmony in the depths of the ocean is in tune with that which comes from the spheres above. We cannot doubt it; for, were it not so—were there no channels of circulation from one ocean to another, and if, accordingly, the waters of the Atlantic were confined to the Atlantic, or if the

waters of the arms and seas of the Atlantic were confined to those arms and seas, and had no channels of circulation by which they could pass out into the ocean, and traverse different latitudes and climates—if this were so, then the machinery of the ocean would be as incomplete as that of a watch without a balance-wheel; for the waters of these arms and seas would, as to their constituents, become, in the process of time, very different from the sea waters in other parts of the world, and their inhabitants would perish for the want of brine of the right strength, or of water of the right temperature.

88. For instance, take the Red Sea and the Mediterranean by way of illustration. Upon the Red Sea there is no precipitation; it is a rainless region; not a river runs down to it, not a brook empties into it; therefore there is no process by which the salts and washings of the earth, which are taken up and held in solution by rain or river water, can be brought down into the Red Sea. Its salts come from the ocean; and the air takes up from it, in the process of evaporation, fresh water, leaving behind all the solid matter which this sea holds in solution.

On the other hand, numerous rivers discharge into the Mediterranean, some of which are filtered through soils and among minerals which yield one kind of salts or soluble matter, another river runs through a limestone or volcanic region of country, and brings down in solution solid matter—it may be common salt, sulphate or carbonate of lime, magnesia, soda, potash, or iron—either or all may be in its waters. Still, the constituents of sea water from the Mediterranean and of sea water from the Red Sea are quite the same. But the waters of the Dead Sea have no connection with those of the ocean; they are cut off from its channels of circulation, and are therefore quite different, as to their components, from any arm, frith, or gulf of the broad ocean. Its inhabitants are also different from those of the high seas.

89. "The solid constituents of sea water amount to about 3½ per cent. of its weight, or nearly half an ounce to the pound. Its saltness may be considered as a necessary result of the present order of things. Rivers which are constantly flowing into the ocean contain salts, varying from ten to fifty, and even one hundred grains per gallon. They are chiefly common salt, sulphate and carbonate of lime, magnesia, soda, potash, and iron; and these are found to constitute the distinguishing characteristics of sea water. The water which evaporates from the sea is nearly pure, containing but very minute traces of salts. Falling as rain upon the land, it washes the soil, percolates through the rocky layers, and becomes charged with saline substances, which are borne seaward by the returning currents. The ocean, therefore, is the great depository of everything that water can dissolve and carry down from the surface of the continents; and, as there is no channel for their escape, they of course consequently accumulate."—*Yeoman's Chemistry.*

"The case of the sea," says Fownes, "is but a magnified representation of what occurs in every lake into which rivers flow, but from which there is no outlet except by evaporation. Such a lake is invariably a salt lake. It is impossible that it can be otherwise; and it is curious to observe that this condition disappears when an artificial outlet is produced for the waters."

How, therefore, shall we account for this sameness of compound, this structure of coral (§ 87), this stability as to animal life in the sea, but upon the supposition of a general system of circulation in the ocean, by which, in process of time, water from one part is conveyed to another part the most remote, and

by which a general interchange and commingling of the waters take place? In like manner, the constituents of the atmosphere, whether it be analyzed at the equator or the poles, are the same. By cutting off and shutting up from the general channels of circulation any portion of sea water, as in the Dead Sea, or of atmospheric air, as in mines or wells, we can easily fill either with gases or other matter that shall very much affect its character, or alter the proportion of its ingredients, and affect the health of its inhabitants.

90. The principal agents that are supposed to be concerned in giving circulation to the atmosphere, and in preserving the ratio among its components, are light, heat, electricity, and magnetism. But with regard to the sea, it is not known what office is performed by electricity and magnetism, in giving dynamical force to its waters in their system of circulation. The chief motive power from which marine currents derive their velocity has been ascribed to heat; but a close study of the agents concerned has suggested that an important—nay, a powerful and active agency in the system of oceanic circulation is derived from the salts of the sea water, through the instrumentality of the winds, of marine plants, and animals. These give the ocean great dynamical force.

91. Let us, for the sake of illustrating and explaining this force, suppose the sea in all its parts—in its depths and at the surface, at the equator and about the poles—to be of one uniform temperature, and to be all of fresh water; and, moreover, that there be neither wind to disturb its surface, nor tides nor rains to raise the level in this part, or to depress it in that. In this case, there would be nothing of heat to disturb its equilibrium, and there would be no motive power (§ 85) to beget currents, or to set the water in motion by reason of the difference of level or of specific gravity due to water at different densities and temperatures.

Now let us suppose the winds, for the first time since the creation, to commence to blow upon this quiescent sea, and to ruffle its surface; they, by their force, would create partial surface currents, and thus agitating the waters to a certain depth, would give rise to a feeble and partial aqueous circulation in the supposed sea of fresh water.

92. This, then, is one of the sources whence power is given to the system of oceanic circulation; but, though a feeble one, it is one which exists in reality, and, therefore, need not be regarded as hypothetical.

Let us next call in evaporation and precipitation, with heat and cold—more powerful agents. Suppose the evaporation to commence from this imaginary fresh-water ocean, and to go on as it does from the seas as they are. In those regions, as in the trade-wind regions, where evaporation is in excess of precipitation (§ 23), the general level of this supposed sea would be altered, and, immediately, as much water as is carried off by evaporation would commence to flow in from north and south toward the trade-wind or evaporating region, to restore the level.

93. On the other hand, the winds have taken this vapor, borne it off to the extra-tropical regions, and precipitated it (§ 28), we will suppose, where precipitation is in excess of evaporation. Here is another alteration of sea level by elevation instead of by depression; and hence we have the motive power for a surface current from each pole toward the equator, the object of which is only to supply the demand for

evaporation in the trade-wind regions—demand for evaporation being taken here to mean the difference between evaporation and precipitation for any part of the sea.

94. Now imagine this sea of uniform temperature (§ 91) to be suddenly stricken with the invisible wand of heat and cold, and its waters brought to the various temperatures at which they at this instant are standing. This change of temperature would make a change of specific gravity in the waters, which would destroy the equilibrium of the whole ocean, upon which a set of currents would immediately commence to flow, viz: a current of cold and heavy water to the warm, and a current of warm and lighter to the cold.

The motive power of these would be difference of specific gravity due difference of temperature in fresh water.

95. We have now traced (§§ 92 and 94) the effect of two agents, which, in a sea of fresh water, would tend to create currents, and to beget a system of aqueous circulation; but a set of currents and a system of circulation which, it is readily perceived, would be quite different from those which we find in the salt sea. One of these agents would be employed (§ 93) in restoring, by means of one or more polar currents, the water that is taken from one part of the ocean by evaporation, and deposited in another by precipitation. The other agent would be employed in restoring, by the forces due difference of specific gravity (§ 94), the equilibrium, which has been disturbed by heating, and of course expanding, the waters of the torrid zone on one hand, and by cooling, and consequently contracting, those of the frigid zone on the other. This agency would, if it were not modified by others, find expression in a system of currents and counter-currents, or rather in a set of surface currents of warm and light water from the equator toward the poles, and in another set of under currents of cooler, dense, and heavy water from the poles toward the equator.

Such, keeping out of view the influence of the winds, which we may suppose would be the same, whether the sea were salt or fresh, would be the system of oceanic circulation were the sea all of fresh water. But fresh water, in cooling, begins to expand near the temperature of 40°, and expands more and more till it reaches the freezing point, and ceases to be fluid. This law of expansion by cooling would impart a peculiar feature to the system of oceanic circulation were the waters all fresh, which it is not necessary to notice further than to say it cannot exist in seas of salt water, for salt water contracts as its temperature is lowered to its freezing point. Hence, in consequence of its salts, changes of temperature derive increased power to disturb the equilibrium of the ocean.

96. If this train of reasoning be good, we may infer that, in a system of oceanic circulation, the dynamical force to be derived from difference of temperature, where the waters are all fresh, would be quite feeble; and that, were the sea not salt, we should probably have no such current in it as the Gulf Stream.

So far we have been reasoning hypothetically, to show what would be the chief agents, exclusive of the winds, in disturbing the equilibrium of the ocean were its waters fresh and not salt. And whatever disturbs equilibrium there, may be regarded as the *primum mobile* in any system of marine currents.

Let us now proceed another step in the process of explaining and illustrating the effect of the salts of

the sea in the system of oceanic circulation. To this end, let us suppose this imaginary ocean of fresh water suddenly to become that which we have, viz: an ocean of salt water, which contracts as its temperature is lowered (§ 95) till it reaches 28° or thereabout.

97. Let evaporation now commence in the trade-wind region, as it was supposed to do (§ 92) in the case of the fresh-water seas, and as it actually goes on in nature—and what takes place? Why, a lowering of the sea level, as before. But as the vapor of salt water is fresh, or nearly so, fresh water only is taken up from the ocean; that which remains behind is therefore more salt. Thus, while the level is lowered in the *salt* sea, the equilibrium is destroyed because of the saltness of the water; for the water that remains after the evaporation takes place is, on account of the solid matter held in solution, specifically heavier than it was before any portion of it was converted into vapor.

The vapor is taken from the surface water; the surface water thereby becomes more salt, and, under certain conditions, heavier; when it becomes heavier, it sinks; and hence we have, due to the salts of the sea, a vertical circulation, viz: a descent of heavier—because salter and cooler—water from the surface, and an ascent of water that is lighter—because it is not so salt—from the depths below.

98. This vapor, then, which is taken up from the evaporating regions (§ 23), is carried by the winds through their channels of circulation, and poured back into the ocean where the regions of precipitation are; and by the regions of precipitation I mean those parts of the ocean, as in the polar basins, where the ocean receives more fresh water in the shape of rain, snow, &c., than it returns to the atmosphere in the shape of vapor.

In the precipitating regions, therefore, the level is destroyed, as before explained, by elevation; and in the evaporating regions, by depression; which, as already stated (§ 93), gives rise to a system of surface currents, moved by gravity alone, from the poles toward the equator.

But we are now considering the effects of evaporation and precipitation in giving impulse to the circulation of the ocean where its waters are *salt*.

The fresh water that has been taken from the evaporating regions is deposited upon those of precipitation, which, for illustration merely, we will locate in the north polar basin. Among the sources of supply of fresh water for this basin, we must include not only the precipitation which takes place over the basin itself, but also the amount of fresh water discharged into it by the rivers of the great hydrographical basins of Arctic Europe, Asia, and America.

This fresh water, being emptied into the Polar Sea, and agitated by the winds, becomes mixed with the salt; but, as the agitation of the sea by the winds extends to no great depth (§ 91), it is only the upper layer of salt water, and that to a moderate depth, which becomes mixed with the fresh. The specific gravity of this upper layer, therefore, is diminished just as much as the specific gravity of the sea water in the evaporating regions was increased. And thus we have a surface current of saltish water from the poles toward the equator, and an under current of water, salter and heavier, from the equator to the poles. This under current supplies, in a great measure, the salt which the upper current, freighted with fresh water from the clouds and rivers, carries back.

Thus it is to the salts of the sea that we owe that feature in the system of oceanic circulation which causes an under current to flow from the Mediterranean into the Atlantic, and another from the Red Sea into the Indian Ocean. And it is evident, since neither of these seas is salting up, that just as much, or nearly just as much salt as the under current brings out, just so much the upper currents carry in.

We now begin to perceive what a powerful impulse is derived from the salts of the sea in giving effective and active circulation to its waters.

99. Hence we infer that the currents of the sea, by reason of its saltness, attain their maximum of volume and velocity. Hence, too, we infer that the transportation of warm water from the equator toward the frozen regions of the poles, and of cold water from the frigid toward the torrid zone, is facilitated; and consequently here, in the saltness of the sea, have we not an agent by which climates are mitigated—by which they are softened and rendered much more salubrious than it would be possible for them to be were the waters of the ocean deprived of this property of saltness?

This property of saltness imparts to the waters of the ocean another peculiarity, by which the sea is still better adapted for the regulation of climates, and it is this: by evaporating fresh water from the salt in the tropics, the surface water becomes heavier than the average of sea water (§ 24). This heavy water is also warm water; it sinks, and being a good retainer, but a bad conductor of heat, this warm water is employed in transporting through under currents heat for the mitigation of climates in far-distant regions. Now this, also, is a property which a sea of fresh water could not have. Let the winds take up their vapor from a sheet of fresh water, and that at the bottom is not disturbed, for there is no change in the specific gravity of that at the surface by which that at the bottom may be brought to the top; but let evaporation go on, though never so gently, from salt water, and the specific gravity of that at the top will soon be so changed as to bring that from the very lowest depths of the sea speedily to the top.

If these inferences as to the influence of the salts upon the currents of the sea be correct, the same cause which produces an under current from the Mediterranean, and an under current from the Red Sea into the ocean, should produce an under current from the ocean into the north polar basin. In each case, the hypothesis with regard to the part performed by the salt, in giving vigor to the system of oceanic circulation, requires that, counter to the surface current of water with less salt, there should be an under current of water with more salt in it.

That such is the case with regard both to the Mediterranean and the Red Sea, is amply shown in other parts of this work, and abundantly proved by other observers.

100. That there is a constant current setting out of the Arctic Ocean through Davis's and other straits thereabout, which connect it with the Atlantic Ocean, is generally admitted. Lieutenant De Haven, United States Navy, when in command of the American expedition in search of Sir John Franklin, was frozen up with his vessels in the main channel of Wellington Straits; and during the nine months that he was so frozen, his vessels, holding their place in the ice, were drifted with it bodily for more than a thousand miles toward the south.

The ice in which they were bound was of sea water, and the currents by which they were drifted

were of sea water—only, it may be supposed, the latter were not quite so salt as the sea water generally is. The same phenomenon is repeated in the Sound, where (§ 113) an under current of salt water runs in, and an upper current of brackish water (§§ 135 and 142) runs out.

Then, since there is salt always flowing out of the north polar basin, we infer that there must be salt always flowing into it, else it would either become fresh, or the whole Atlantic Ocean would be finally silted up with salt.

It might be supposed, were there no evidence to the contrary, that this salt was supplied to the polar seas from the Atlantic around North Cape, and from the Pacific through Behring's Straits, and through no other channels.

101. But, fortunately, Arctic voyagers, who have cruised in the direction of Davis's Straits, have afforded us, by their observations, proof positive as to the fact of this other source for supplying the polar seas with salt. They tell us of an under current setting from the Atlantic toward the polar basin. They describe huge icebergs, with tops high up in the air, and of course the bases of which extend far down into the depths of the ocean, ripping and tearing their way, with terrific force and awful violence, through the surface ice or against a surface current, on their way into the polar basin.

Passed Midshipman S. P. Griffin, who commanded the brig Rescue in the American searching expedition after Sir John Franklin, informs me that, on one occasion, the two vessels were endeavoring to warp up to the northward, in or near Wellington Channel, against a strong surface current, which of course was setting to the south; and that while so engaged, an iceberg, with its top many feet above the water, came "drifting up" from the south, and passed by them "like a shot." Although they were stemming a surface current against both the berg and themselves, such was the force and velocity of the under current, that it carried the berg to the northward faster than the crew could warp the vessel against a surface but counter-current.

Captain Duncan, master of the English whale-ship Dundee, says, at page 76 of his interesting little narrative:—*

"*December* 18 (1826). It was awful to behold the immense icebergs working their way to the northeast from us, and not one drop of water to be seen; they were working themselves right through the middle of the ice."

And again, at page 92, &c.:—

"*February* 23. Latitude 68° 37′ north, longitude about 63° west.

"The dreadful apprehensions that assailed us yesterday, by the near approach of the iceberg, were this day most awfully verified. About three P. M., the iceberg came in contact with our floe, and in less than one minute it broke the ice; we were frozen in quite close to the shore; the floe was shivered to pieces for several miles, causing an explosion like an earthquake, or one hundred pieces of heavy ordnance fired at the same moment. The iceberg, with awful but majestic grandeur (in height and dimensions

* Arctic Regions; Voyage to Davis's Straits, by Dorea Duncan, Master of ship Dundee, 1826, 1827.

resembling a vast mountain), came almost up to our stern, and every one expected it would have run over the ship. . . . .

"The iceberg, as before observed, came up very near to the stern of our ship; the intermediate space between the berg and the vessel was filled with heavy masses of ice, which, though they had been previously broken by the immense weight of the berg, were again formed into a compact body by its pressure. The berg was drifting at the rate of about four knots, and by its force on the mass of ice, was pushing the ship before it, as it appeared, to inevitable destruction."

"*Feb.* 24. The iceberg still in sight, but driving away fast to the northeast."

"*Feb.* 25. The iceberg, that so lately threatened our destruction, had driven completely out of sight to the northeast from us."

Now, then, whence, unless from the difference of specific gravity due sea water of different degrees of saltness, can we derive a motive power with force sufficient to give such tremendous masses of ice such a velocity?

102. What is the temperature of this under current? Be that what it may, it is probably above the freezing point of sea water. Suppose it to be at 32°. (Break through the ice in the northern seas, and the temperature of the surface water is always 28°. At least Lieutenant De Haven so found it in his long imprisonment, and it may be supposed that, as it was with him, so it generally is.) Assuming, then, the water of the surface current which runs out with the ice to be all at 28°, we observe that it is not unreasonable to suppose that the water of the under current, inasmuch as it comes from the south, and therefore from warmer latitudes, is probably not so cold; and if it be not so cold, its temperature, before it comes out again, must be reduced to 28°, or whatever be the average temperature of the outer but surface current.

Moreover, if it be true, as some philosophers have suggested, that there is in the depths of the ocean a line from the equator to the poles along which the water is of the same temperature all the way, then the question may be asked, Should we not have in the depths of the ocean a sort of isothermal floor, as it were, on the upper side of which all the changes of temperature are due to agents acting from above, and on the lower side of which, the changes, if any, are due to agents acting from below?

This under polar current water, then, as it rises to the top, and is brought to the surface by the agitation of the sea in the Arctic regions, gives out its surplus heat and warms the atmosphere there till the temperature of this warm under current water is lowered to the requisite degree for going out on the surface. Hence the water-sky of those regions.

And the heat that it loses in falling from its normal temperature, be that what it may, till it reaches the temperature of 28°, is so much caloric set free in the polar regions, to temper the air and mitigate the climate there. Now is not this one of those modifications of climate which may be fairly traced back to the effect of the saltness of the sea in giving energy to its circulation?

Moreover, if there be a deep sea in the polar basin, which serves as a receptacle for the waters brought into it by this under current, which, because it comes from toward the equatorial regions, comes

from a milder climate, and is therefore warmer, we can easily imagine why there might be an open sea in the polar regions—why Lieutenant De Haven, in his instructions, was directed to look for it; and why both he and Captain Penny, of one of the English searching vessels, found it there.

And in accounting for this polynia, we see that its existence is not only consistent with the hypothesis with which we set out, touching a perfect system of oceanic circulation, but that it may be ascribed, in a great degree, at least, if not wholly, to the effect produced by the salts of the sea upon the mobility and circulation of its waters.

Here, then, is an office which the sea performs in the economy of the universe by virtue of its saltness, and which it could not perform were its waters altogether fresh. And thus philosophers have a clew placed in their hands which will probably guide them to one of the many hidden reasons that are embraced in the true answer to the question, "Why is the sea salt?"

103. We find in sea water other matter besides common salt. Lime is dissolved by the rains and the rivers, and emptied in vast quantities into the ocean. Out of it, coral islands and coral reefs of great extent—marl-beds, shell-banks, and infusorial deposits of enormous magnitude have been constructed by the inhabitants of the deep. These creatures are endowed with the power of secreting, apparently for their own purposes only, solid matter, which the waters of the sea hold in solution. But this power was given to them that they also might fulfil the part assigned them in the economy of the universe. For to them, probably, has been allotted the important office of assisting in giving circulation to the ocean, of helping to regulate the climates of the earth, and of preserving the purity of the sea.

The better to comprehend how such creatures may influence currents and climates, let us suppose the ocean to be perfectly at rest—that, throughout, it is in a state of complete equilibrium—that, with the exception of those tenants of the deep which have the power of extracting from it the solid matter held in solution, there is no agent in nature capable of disturbing that equilibrium—and that all these fish, &c., have suspended their secretions, in order that this state of a perfect aqueous equilibrium and repose throughout the sea might be attained

In this state of things—the waters of the sea being in perfect equilibrium—a single mollusk or coralline, we will suppose, commences his secretions, and abstracts from the sea water (§ 87) solid matter for his cell. In that act, this animal has destroyed the equilibrium of the whole ocean, for the specific gravity of that portion of water from which this solid matter has been extracted is altered. Having lost a portion of its solid contents, it has become specifically lighter than it was before; it must, therefore, give place to the pressure which the heavier water exerts to push it aside and to occupy its place, and it must consequently travel about and mingle with the waters of the other parts of the ocean until its proportion of solid matter is returned to it, and until it attains the exact degree of specific gravity due sea water generally.

How much solid matter does the whole host of marine plants and animals abstract from sea water daily? Is it a thousand pounds or a thousand millions of tons? No one can say. But, whatever be its weight, it is so much of the power of gravity applied to the dynamical forces of the ocean. And this power is derived from the salts of the sea, through the agency of sea-shells and other marine animals, that

of themselves scarcely possess the power of locomotion. Yet they have power to put the whole sea in motion, from the equator to the poles, and from top to bottom.

Those powerful and strange equatorial currents (§ 121), which navigators tell us they encounter in the Pacific Ocean, to what are they due? Coming from sources unknown, they are lost in the midst of the ocean. They are due, no doubt, to some extent, to the effects of precipitation and evaporation, and the change of heat produced thereby. But we have yet to inquire, How far may they be due to the derangement of equilibrium arising from the change of specific gravity caused by the secretions of the myriads of marine animals that are continually at work in those parts of the ocean? These abstract from sea water solid matter enough to build continents of. And, also, we have to inquire as to the extent to which equilibrium in the sea is disturbed by the salts which evaporation leaves behind.

Thus, when we consider the salts of the sea in one point of view, we see the winds and the marine animals operating upon the waters, and, in certain parts of the ocean, deriving from the solid contents of the same those very principles of antagonistic forces which hold the earth in its orbit, and preserve the harmonies of the universe.

In another point of view, we see how the sea-breeze and the sea-shell, in performing their appointed offices, act so as to give rise to a reciprocating motion in the waters; and thus they impart to the ocean dynamical forces also for its circulation.

The sea-breeze plays upon the surface; it converts only fresh water into vapor, and leaves the solid matter behind. The surface water thus becomes specifically heavier, and sinks. On the other hand, the little marine architect below, as he works upon his coral edifice at the bottom, abstracts from the water there a portion of its solid contents; it therefore becomes specifically lighter, and up it goes, ascending to the top with increased velocity, to take the place of the descending column, which, by the action of the winds, has been sent down loaded with fresh food and materials for the busy little mason in the depths below.

Seeing, then, that the inhabitants of the sea, with their powers of secretion, are competent to exercise at least some degree of influence in disturbing equilibrium, are not these creatures entitled to be regarded as agents which have their offices to perform in the system of oceanic circulation, and do not they belong to its physical geography? It is immaterial how great or how small that influence may be supposed to be; for, be it great or small, we may rest assured it is not a chance influence, but it is an influence exercised—if exercised at all—by design, and according to the commandment of Him whose "voice the winds and the sea obey." Thus God speaks through sea-shells to the ocean.

It may therefore be supposed that the arrangements in the economy of nature are such as to require that the various kinds of marine animals, whose secretions are calculated to alter the specific gravity of sea water, to destroy its equilibrium, to beget currents in the ocean, and to control its circulation, should be distributed according to order.

104. Upon this supposition—the like of which nature warrants throughout her whole domain—we may conceive how the marine animals of which we have been speaking may impress other features upon

the physical relations of the sea by assisting also to regulate climates, and to adjust the temperature of certain latitudes. For instance, let us suppose the waters in a certain part of the torrid zone to be 70°, but by reason of the fresh water which has been taken from them in a state of vapor, and consequently by reason of the proportionate increase of salts, these waters are heavier than waters that may be cooler, but not so salt.

This being the case, the tendency would be for this warm, but salt and heavy water, to flow off as an under current toward the polar or some other regions of lighter water.

Now if the sea were not salt, there would be no coral islands to beautify its landscape and give variety to its features; sea-shells and marine insects could not operate upon the specific gravity of its waters, nor give variety to its climates; neither could evaporation give dynamical force to its circulation, and they, ceasing to contract as their temperature falls below 40°, would give but little impulse to its currents, and thus its circulation would be torpid, and its bosom lack animation.

This under current may be freighted with heat to temper some hyperborean region or to soften some extra-tropical climate (§ 147), for we know that such is among the effects of marine currents. At starting, it might have been, if you please, so loaded with solid matter, that, though its temperature were 70°, yet, by reason of the quantity of such matter held in solution, its specific gravity might have been greater even than that of extra-tropical sea water generally at 28°.

Notwithstanding this, it may be brought into contact, by the way, with those kinds and quantities of marine organisms that shall abstract solid matter enough to reduce its specific gravity, and, instead of leaving it greater than common sea water at 28°, make it less than common sea water at 40°; consequently, in such a case, this warm sea water, when it comes to the cold latitudes, would be brought to the surface through the instrumentality of shell-fish, and various other tribes that dwell far down in the depths of the ocean. Thus we perceive that these creatures, though they are regarded as being so low in the scale of creation, may nevertheless be regarded as agents of much importance in the terrestrial economy; for we perceive that they are capable of spreading over certain parts of the ocean those benign mantles of warmth which temper the winds, and modify, more or less, all the marine climates of the earth.

105. The makers of nice astronomical instruments, when they have put the different parts of their machinery together, and set it to work, find, as in the chronometer, for instance, that it is subject in its performance to many irregularities and imperfections—that in one state of things there is expansion, and in another state contraction among cogs, springs, and wheels, with an increase or diminution of rate. This defect the makers have sought to overcome; and, with a beautiful display of ingenuity, they have attached to the works of the instrument a contrivance which has had the effect of correcting these irregularities, by counteracting the tendency of the instrument to change its performance with the changing influences of temperature.

This contrivance is called a *compensation;* and a chronometer that is well regulated and properly compensated will perform its office with certainty, and preserve its rate under all the vicissitudes of heat and cold to which it may be exposed.

In the clock-work of the ocean and the machinery of the universe, order and regularity are maintained by a system of compensations. A celestial body, as it revolves around its sun, flies off under the influence of centrifugal force; but immediately the forces of compensation begin to act; the planet is brought back to its elliptical path, and held in the orbit for which its mass, its motions, and its distance were adjusted. Its compensation is perfect.

So, too, with the salts and the shells of the sea in the machinery of the ocean; from them are derived principles of compensation the most perfect; through their agency the undue effects of heat and cold, of storm and rain, in disturbing the equilibrium, and producing thereby currents in the sea, are compensated, regulated, and controlled.

The dews, the rains, and the rivers are continually dissolving certain minerals of the earth, and carrying them off to the sea. This is an accumulating process; and if it were not *compensated*, the sea would finally become as the Dead Sea is, saturated with salt, and therefore unsuitable for the habitation of many fish of the sea.

The sea-shells and marine insects afford the required *compensation.* They are conservators of the ocean. As the salts are emptied into the sea, these creatures secrete them again and pile them up in solid masses, to serve as the bases of islands and continents, to be in the process of ages upheaved into dry land, and then again dissolved by the dews and rains, and washed by the rivers away into the sea.

Darwin, many years ago, during one of those moments of inspiration which enabled him to foreshadow the steamboat and the locomotive, told philosophers whence came the salts and the solid matter out of which sea-shells and coral reefs are built.

> "Gnomes! You then taught transuding dews to pass
> Through time-fall'n woods and root-inwove morass
> Age after age; and with filtration fine
> Dispart from earths, and sulphurs, and saline.
> Hence with diffusive salt old ocean steeps
> His emerald shallows, and his sapphire deeps."

We have reason, I think, for the conjecture that the sea was salt early "in the beginning," when "the waters under heaven were gathered together unto one place," and the dry land first appeared. Go back as far as we may in the dim records which young Nature has left inscribed upon the geological column of her early processes, and there we find the fossil shell and the remains of marine organisms, to inform us that when the foundations of our mountains were laid with granite, and immediately succeeding that remote period when the primary formations were completed, the sea was as it is now, salt; for had it not been salt, whence could those creeping things which fashioned the sea-shells that cover the tops of the Andes, or those madrepores that strew the earth with solid matter that has been secreted from briny waters, or those infusorial deposits which astound the geologist with their magnitude and extent, or those fossil remains of the sea which have astonished, puzzled, and bewildered man in all ages—whence, had not the sea been salt, when its metes and bounds were set, could these creatures have obtained solid matter for their edifices

and structures? Much of that part of the earth's crust which man stirs up in cultivation, and which yields him bread, has been made fruitful by these "salts," which all manner of marine insects, aqueous organisms, and sea-shells have secreted from the ocean. Much of this portion of our planet has been filtered through the sea, and its insects and creeping things are doing now precisely what they were set about when the dry land appeared, viz: preserving the purity of the ocean, and regulating it in the due performance of its great offices. As fast as the rains dissolve the salts of the earth, and send them down through the rivers to the sea, these faithful and everlasting agents of the Creator elaborate them into pearls, shells, corals, and precious things; and so, while they are preserving the sea, they are also embellishing the land by imparting new adaptations to its soil, beauty and variety to its landscapes.

In every department of nature there is to be found this self-adjusting principle—this beautiful and exquisite system of *compensation*, by which the operations of the grand machinery of the universe are maintained in the most perfect order.

106. Thus we behold sea-shells and animalculæ in a new light. May we not now cease to regard them as beings which have little or nothing to do in maintaining the harmonies of creation? On the contrary, do we not see in them the principles of the most admirable compensation in the system of oceanic circulation? We may even regard them as regulators, to some extent, of climates in parts of the earth far removed from their presence. There is something suggestive, both of the grand and the beautiful, in the idea that, while the insects of the sea are building up their coral islands in the perpetual summer of the tropics, they are also engaged in dispensing warmth to distant parts of the earth, and in mitigating the severe cold of the polar winter.

Surely an hypothesis which, being followed out, suggests so much design, such perfect order and arrangement, and so many beauties for contemplation and admiration as does this, which, for the want of a better, I have ventured to offer with regard to the solid matter of the sea water, its salts and its shells—surely such an hypothesis, though it be not based entirely on the results of actual observation, cannot be regarded as wholly vain or as altogether profitless.

CHAPTER VII.

CURRENTS OF THE SEA.*

Governed by Laws, § 107.—The Inhabitants of the Sea the Creatures of Climate, 108.—First Principles, 109.—Currents of the Red Sea, 110.—How an under Current from it is generated, 111.—Why the Red Sea is not salting up, 112.—MEDITERRANEAN CURRENT, 113.—CURRENTS OF THE INDIAN OCEAN, 114.—A Gulf Stream along the Coast of China, 115.—Points of Resemblance between it and the Gulf Stream of the Atlantic, 116.—Geographical Features unfavorable to large Icebergs in the North Pacific, 117.—Arguments in favor of return Currents, because Sea Water is salt, 118.—CURRENTS OF THE PACIFIC, 119.—Discovery of an immense Body of Warm Water drifting South, 120.—Currents about the Equator, 121.—UNDER CURRENTS: Proof of, afforded by Deep Sea Soundings, 122.—Currents caused by Changes in Specific Gravity of Sea Water, 123.—The great Equatorial Current of the Atlantic, 124.—The Cape St. Roque Current not a constant Current, 125.

107. LET us, in this chapter, set out with the postulate that the sea, as well as the air, has its system of circulation, and that this system, whatever it be, and wherever its channels lie, whether in the waters at or below the surface, is in obedience to physical laws. The sea, by the circulation of its waters, has its offices to perform in the terrestrial economy; and when we see the currents in the ocean running hither and thither, we feel that they were not put in motion without a cause. On the contrary, reason assures us that they move in obedience to some law of Nature, be it recorded down in the depths below, never so far beyond the reach of human ken; and being a law of Nature, we know who gave it, and that neither chance nor accident had anything to do with its enactment.

Nature grants us all that this postulate demands, repeating it to us in many forms of expression; she utters it in the blade of green grass which she causes to grow in climates and soils made kind and genial by warmth and moisture, that some current of the sea or air has conveyed far away from under a tropical sun. She murmurs it out in the cooling current of the north; the whales of the sea tell of it, and all its inhabitants proclaim it.

108. The fauna and the flora of the sea are as much the creatures of climate, and are as dependent for their well-being upon temperature as are the fauna and the flora of the dry land. Were it not so, we should find the fish and the algæ, the marine insect and the coral, distributed equally and alike in all parts of the ocean. The polar whale would delight in the torrid zone, and the habitat of the pearl oyster would be also under the iceberg, or in frigid waters colder than the melting ice.

Now water, while its capacities for heat are scarcely exceeded by those of any other substance, is one of the most complete of non-conductors. Heat does not permeate water as it does iron, for instance, or other good conductors. Heat the top of an iron plate, and the bottom becomes warm; but heat the top of a sheet of water, as in a pool or basin, and that at the bottom remains cool. The heat passes through iron

* *Vide* Maury's Physical Geography of the Sea. Harper and Brothers, New York.

by conduction, but to get through water it requires to be conveyed by a motion, which in fluids we call currents.

Therefore the study of the climates of the sea involves a knowledge of its currents, both cold and warm. They are the channels through which the waters circulate, and by means of which the harmonies of old ocean are preserved.

109. Hence, in studying the system of oceanic circulation, we set out with the very simple assumption, viz: that from whatever part of the ocean a current is found to run, to the same part a current of equal volume is obliged to return; for, upon this principle is based the whole system of currents and counter-currents of the air as well as of the water.

It is not necessary to associate with oceanic currents the idea that they must of necessity, as on land, run from a higher to a lower level. So far from this being the case, some currents of the sea actually run up hill, while others run on a level.

The Gulf Stream is of the first class.

110. The currents which run from the Atlantic into the Mediterranean, and from the Indian Ocean into the Red Sea, are the reverse of this. Here the bottom of the current is probably a water-level, and the top an inclined plane, running *down hill.* Take the Red Sea current as an illustration. That sea lies, for the most part, within a rainless and riverless district. It may be compared to a long and narrow trough. Being in a rainless district, the evaporation from it is immense; none of the water thus taken up is returned to it, either by rivers or rains. It is about one thousand miles long; it lies nearly north and south, and extends from latitude 13° to the parallel of 30° north.

From May to October, the water in the upper part of this sea is said to be two feet lower than it is near the mouth.* This change or difference of level is ascribed to the effect of the wind, which, prevailing from the north at that season, is supposed to blow the water out.

But, from May to October is also the hot season; it is the season when evaporation is going on most rapidly; and when we consider how dry and how hot the winds are which blow upon this sea at this season of the year, we may suppose the daily evaporation to be immense; not less, certainly, than half an inch, and probably twice that amount. We know that the waste from canals by evaporation, in the summer time, is an element which the engineer, when taking the capacity of his feeders into calculation, has to consider. With him it is an important element; how much more so must the waste by evaporation from this sea be, when we consider the physical conditions under which it is placed. Its feeder, the Arabian Sea, is a thousand miles from its head; its shores are burning sands; the evaporation is *ceaseless;* and none of the vapors, which the scorching winds that blow over it carry away, are returned to it again in the shape of rains.

The Red Sea vapors are carried off and precipitated elsewhere. The depression in the level of its

* Johnston's Physical Atlas.

head waters in the summer time, therefore, it appears, is owing quite as much to the effect of evaporation as to that of the wind blowing the waters back.

The evaporation in certain parts of the Indian Ocean is from three-fourths of an inch to an inch daily. Suppose it for the Red Sea, in the summer time, to average only half an inch a day.

Now, if we suppose the velocity of the current which runs into that sea to average, from mouth to head, twenty miles a day, it would take the water fifty days to reach the head of it. If it lose half an inch from its surface by evaporation daily, it would, by the time it reaches the Isthmus of Suez, lose twenty-five inches from its surface.

Thus the waters of the Red Sea ought to be lower at the Isthmus of Suez than they are at the Straits of Babelmandeb. Independently of the waters forced out by the wind, they ought to be lower from two other causes, viz: evaporation and temperature, for the temperature of that sea is necessarily lower at Suez, in latitude 30°, than it is at Babelmandeb, in latitude 13°.

To make it quite clear that the surface of the Red Sea is not a sea level, but is an inclined plane, suppose the channel of the Red Sea to have a perfectly smooth and level floor, with no water in it, and a wave ten feet high to enter the Straits of Babelmandeb, and to flow up the channel at the rate of twenty miles a day for fifty days, losing daily, by evaporation, half an inch; it is easy to perceive that, at the end of the fiftieth day, this wave would not be so high, by two feet (twenty-five inches), as it was the first day it commenced to flow.

The top of that sea, therefore, may be regarded as an inclined plane, made so by evaporation.

111. But the salt water, which has lost so much of its freshness by evaporation, becomes salter, and therefore heavier. The lighter water at the Straits cannot balance the heavier water at the Isthmus, and the colder and salter, and therefore heavier water, must either run out as an under current, or it must deposit its surplus salt in the shape of crystals, and thus gradually make the bottom of the Red Sea a salt-bed, or it must abstract all the salt from the ocean to make the Red Sea brine—and we know that neither the one process nor the other is going on. Hence we infer that there is from the Red Sea an under or outer current, as there is from the Mediterranean through the Straits of Gibraltar, and that the surface waters near Suez are salter than those near the mouth of the Red Sea.

And, to show why there should be an outer and under current from each of these two seas, let us suppose the case of a long trough, opening into a vat of oil, with a partition to keep the oil from running into the trough. Now, suppose the trough to be filled up with wine on one side of the partition to the level of the oil on the other. The oil is introduced to represent the lighter water as it enters either of these seas from the ocean, and the wine the same water after it has lost some of its freshness by evaporation, and therefore has become salter and heavier. Now, suppose the partition to be raised, what would take place? Why, the oil would run in as an upper current, overflowing the wine, and the wine would run out as an under current.

The rivers which discharge in the Mediterranean are not sufficient to supply the waste of evaporation, and it is by a process similar to this that the salt which is carried in from the ocean is returned to the

ocean again; were it not so, the bed of that sea would be a mass of solid salt. The equilibrium of the seas is preserved, beyond a doubt, by a system of compensation as exquisitely adjusted as are those by which the "music of the spheres" is maintained.

The above about under currents is theory: Now let us see the results of actual observation upon the density of water in the Red Sea and the Mediterranean, and upon the under currents that run out from these seas.

Four or five years ago, Mr. Morris, chief engineer of the Oriental Company's steamship Ajdaha, collected specimens of Red Sea water all the way from Suez to the Straits of Babelmandeb, which were afterward examined by Dr. Giraud, who reported the following results:—*

	Latitude. °	Longitude. °	Spec. Grav.	Saline Cont. 1000 parts.
No. 1. Sea at Suez . . .	—	—	1027	41.0
No. 2. Gulf of Suez . . .	27.49	33.44	1026	40.0
No. 3. Red Sea	24.29	36.	1024	39.2
No. 4. do.	20.55	38.18	1026	40.5
No. 5. do.	20.43	40.03	1024	39.8
No. 6. do.	14.34	42.43	1024	39.9
No. 7. do.	12.39	44.45	1023	39.2

These observations agree with the theoretical deductions just announced, and show that the surface waters at the head are heavier and salter than the surface waters at the mouth of the Red Sea.

In the same paper, the temperature of the air between Suez and Aden often rises, it is said, to 90°, "and probably averages little less than 75° day and night all the year round. The surface of the sea varies in heat from 65° to 85°, and the difference between the wet and dry bulb thermometers often amounts to 25°—in the kamsin, or desert winds, to from 30° to 40°; the average evaporation at Aden is about eight feet for the year." "Now, assuming," says Dr. Buist, "the evaporation of the Red Sea to be no greater than that of Aden, a sheet of water eight feet thick, equal in area to the whole expanse of the sea, will be carried off annually in vapor; or assuming the Red Sea to be eight hundred feet in depth at an average—and this, most assuredly, is more than double the fact—the whole of it would be dried up, were no water to enter from the ocean, in one hundred years. The waters of the Red Sea, throughout, contain some four per cent. of salt by weight—or, as salt is a half heavier than water, some 2.7 per cent. in bulk—or, in round numbers, say three per cent. In the course of three thousand years, on the assumptions just made, the Red Sea ought to have been one mass of solid salt, if there were no current running out."

112. Now we know the Red Sea is more than three thousand years old, and that it is not filled with

* Transact. of the Bombay Geograph. Soc., vol. ix., May, 1849, to August, 1850.

salt; and the reason is, that as fast as the upper currents bring the salt in at the top, the under currents carry it out at the bottom.

113. Mediterranean Currents.—With regard to an under current from the Mediterranean, we may begin by remarking that we know that there is a current always setting in at the surface from the Atlantic, and that this is a salt-water current, which carries an immense amount of salt into that sea. We know, moreover, that that sea is not salting up; and therefore, independently of the postulate (§ 109) and of observations, we might infer the existence of an under current, through which this salt finds its way out into the broad ocean again.*

With regard to this outer and under current, we have observations telling of its existence as long ago as 1712.

"In the year 1712," says Dr. Hudson, in a paper communicated to the Philosophical Society in 1724, "Monsieur du L'Aigle, that fortunate and generous commander of the privateer called the Phœnix, of Marseilles, giving chase near Ceuta Point to a Dutch ship bound to Holland, came up with her in the middle of the Gut between Tariffa and Tangier, and there gave her one broadside, which directly sunk her, all her men being saved by Monsieur du L'Aigle; and in a few days after, the Dutch ship, with her cargo of brandy and oil, arose on the shore near Tangier, which is at least four leagues to the westward of the place where she sunk, and directly against the strength of the current, which has persuaded many men that there is a recurrency in the deep water in the middle of the Gut that sets outward to the grand ocean, which this accident very much demonstrates; and, possibly, a great part of the water which runs into the Straits returns that way, and along the two coasts before mentioned; otherwise, this ship must, of course, have been driven toward Ceuta, and so upward. The water in the Gut must be very deep; several of the commanders of our ships of war having attempted to sound it with the longest lines they could contrive, but could never find any bottom."

In 1828, Dr. Wollaston, in a paper before the Philosophical Society, stated that he found the specific gravity of a specimen of sea water, from a depth of six hundred and seventy fathoms, fifty miles within the Straits, to have a "density exceeding that of distilled water by more than four times the usual excess, and accordingly leaves, upon evaporation, more than four times the usual quantity of saline residuum.

* Dr. Smith appears to have been the first to *conjecture* this explanation, which he did in 1683 (vide *Philosophical Transactions*). This continual indraught into the Mediterranean appears to have been a vexed question among the navigators and philosophers even of those times. Dr. Smith alludes to several hypotheses which had been invented to solve these phenomena, such as subterraneous vents, cavities, exhalation by the sun's beams, &c., and then offers his *conjecture*, which, in his own words, is, "that there is an under current, by which as great a quantity of water is carried out as comes flowing in. To confirm which, besides what I have said above about the difference of tides in the offing and at the shore in the Downs, which necessarily supposes an under current, I shall present you with an instance of the like nature in the Baltic Sound, as I received it from an able seaman, who was at the making of the trial. He told me that, being there in one of the king's frigates, they went with their pinnace into the mid stream, and were carried violently by the current; that, soon after this, they sunk a bucket with a heavy cannon ball to a certain depth of water, which gave a check to the boat's motion; and, sinking it still lower and lower, the boat was driven ahead to the windward against the upper current: the current aloft, as he added, not being over four or five fathoms deep, and that the lower the bucket was let fall, they found the under current the stronger."

Hence it is clear that an under current outward of such denser water, if of equal breadth and depth with the current inward near the surface, would carry out as much salt below as it brought in above, although it moved with less than one-fourth part of the velocity, and would thus prevent a perpetual increase of saltness in the Mediterranean Sea beyond that existing in the Atlantic."

The doctor obtained this specimen of sea water from Captain, now Admiral Smyth, of the English Navy, who had collected it for Dr. Marcet. Dr. Marcet died before receiving it, and it had remained in the admiral's hands some time before it came into those of Wollaston.

It may, therefore, have lost something by evaporation; for it is difficult to conceive that all the river water, and three-fourths of the sea water which runs into the Mediterranean, is evaporated from it, leaving a brine for the under current having four times as much salt as the water at the surface of the sea usually contains. Very recently, M. Coupvent des Bois is said to have shown, by actual observation, the existence of an outer and under current from the Mediterranean.

However that may be, these facts, and the statements of the Secretary of the Geographical Society of Bombay (§ 111), seem to leave no room to doubt as to the existence of an under current both from the Red Sea and Mediterranean, and as to the cause of the surface current which flows into them. I think it a matter of demonstration. It is accounted for (§ 111) by the salts of the sea.

Writers, whose opinions are entitled to great respect, differ with me as to the proof of this demonstration. Among these writers are Admiral Smyth, of the British Navy, and Sir Charles Lyell, who also differ with each other. In 1820, Dr. Marcet, being then engaged in studying the chemical composition of sea water, the admiral, with his usual alacrity for doing "a kind turn," undertook to collect for the doctor specimens of Mediterranean water from various depths, especially in and about the Straits of Gibraltar. Among these was the one taken fifty miles within the Straits from the depth of six hundred and seventy fathoms (four thousand and twenty feet), which, being four times salter than common sea water, left, as we have just seen, no doubt in the mind of Dr. Wollaston as to the existence of this under current of brine.

But the indefatigable admiral, in the course of his celebrated survey of the Mediterranean, discovered that, while inside of the Straits, the depth was upward of nine hundred fathoms, yet, in the Straits themselves, the depth across the shoalest section is not more than one hundred and sixty* fathoms.

"Such being the case, we can now prove," exclaims Sir Charles Lyell, "that the vast amount of salt brought into the Mediterranean *does not* pass out again by the Straits; for it appears by Captain Smyth's soundings, which Dr. Wollaston had not seen, that between the Capes of Trafalgar and Spartel, which are twenty-two miles apart, and where the Straits are shallowest, the deepest part, which is on the side of Cape Spartel, is only two hundred and twenty fathoms.† It is therefore evident, that if water sinks in certain parts of the Mediterranean, in consequence of the increase of its specific gravity, to greater depths than two

* The Mediterranean.

† One hundred and sixty, Smyth.

hundred and twenty fathoms, it can never flow out again into the Atlantic, since it must be stopped by the submarine barrier which crosses the shallowest part of the Straits of Gibraltar."*

According to this reasoning, all the cavities, the hollows and the valleys at the bottom of the sea, especially in the trade-wind region, where evaporation is so constant and great, ought to be salting up or filling up with brine. Is it probable that such a process is actually going on? No.

According to this reasoning, the water at the bottom of the great American lakes ought to be salt, for the rivers and the rains, it is admitted, bring the salts from the land and empty them into the sea. It is also admitted that the great lakes would, from this cause, be salt, if they had no sea drainage. The Niagara River passes these river salts from the upper lakes into Ontario, and the St. Lawrence conveys them thence to the sea. Now, the basins or bottoms of all these upper lakes are far below the *top* of the rock over which the Niagara pitches its flood. And, were the position assumed by this writer correct, viz: that if the water in any of these lakes should, in consequence of its specific gravity, once sink below the level of the shoals in the rivers and straits which connect them, it never could flow out again, and consequently, must remain there forever†—were this principle physically correct, would not the water at the bottom of the lakes gradually have received salt sufficient, during the countless ages that they have been sending it off to the sea, to make this everlastingly pent-up water briny, or at least quite different in its constituents from that of the surface? We may presume that the water at the bottom of every extensive and quiet sheet of water, whether salt or fresh, is at the bottom by reason of specific gravity; but that it does not remain there forever we have abundant proof. If so, the Niagara River would be fed by Lake Erie only from that layer of water which is above the level of the top of the rock at the Falls. Consequently, wherever the breadth of that river is no greater than it is at the Falls, we should have a current as rapid as it is at the moment of passing the top of the rock to make the leap. To see that such is not the way of Nature, we have but to look at any common mill-pond when the water is running over the dam. The current in the pond that feeds the overflow is scarcely perceptible, for "still water runs deep." Moreover, we know it is not such a skimming current as the geologist would make, which runs from one lake to another; for, wherever above the Niagara Falls the water is deep, there we are sure to find the current sluggish, in comparison with the rate it assumes as it approaches the Falls; and it is sluggish in deep places, rapid in shallow ones, because it is fed from below. The common "wastes" in our canals teach us this fact.

The reasoning of this celebrated geologist appears to be founded upon the assumption that when water, in consequence of its specific gravity, once sinks below the bottom of a current where it is shallowest, there is no force of traction in fluids, nor any other power, which can draw this heavy water up again. If such were the case, we could not have deep water immediately inside of the bars which obstruct the passage of the great rivers into the sea. Thus the bar at the mouth of the Mississippi, with only fifteen feet of water on it, is estimated to travel out to sea at rates varying from one hundred to twenty yards a year.

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* Lyell's Principles of Geology, p. 334–5, ninth edition. London, 1853.

† See paragraph quoted (§ 113) from Lyell's Principles of Geology.

In the place where that bar was when it was one thousand yards nearer to New Orleans than it now is, whether it were fifteen years ago or a century ago, with only fifteen or sixteen feet of water on it, we have now four or five times that depth. As new bars were successively formed seaward from the old, what dug up the sediment which formed the old, and lifted it up from where specific gravity had placed it, and carried it out to sea over a barrier not more than a few feet from the surface? Indeed, Sir Charles himself makes this majestic stream to tear up its own bottom to depths far below the top of the bar at its mouth. He describes the Mississippi as a river having nearly a uniform breadth to the distance of two thousand miles from the sea.* He makes it cut a bed for itself out of the soil, which is heavier than Admiral Smyth's deep sea water, to the depth of more than two hundred feet† below the top of the bar which obstructs its entrance into the sea. Could not the same power which scoops out this solid matter draw the brine up from the pool in the Mediterranean, and pass it out across the barrier in the Straits.

The *traction* of locomotives on railroads and the force of that traction are well understood. Now, have not currents in the deep sea power derived from some such force? Suppose this under current from the Mediterranean to extend one hundred and sixty fathoms down, so as to chafe the barrier across the Straits. Upon the bottom of this current, then, there is a pressure of more than fifty atmospheres. Have we not here a source of power that would be capable of drawing up, by almost an insensibly slow motion, water from almost any depth? At any rate, it appears that the effect of currents by *traction*, or friction, or whatever force, does extend far below the level of their beds in shallow places. Were it not so—were the brine not drawn out again—it would be easy to prove that this indraught into the Mediterranean has taken, even during the period assigned by Sir Charles to the formation of the Delta of the Mississippi—one of the newest formations—salt enough to fill up the whole basin of the Mediterranean with crystals. Admiral Smyth brought up bottom with his briny sample of deep sea water (six hundred and seventy fathoms), but no salt crystals.

The gallant admiral—appearing to withhold his assent both from Dr. Wollaston in his conclusions as to this under current, and from the geologist in his inferences as to the effect of the barrier in the Straits—suggests the probability that, in sounding for the heavy specimen of sea water, he struck a brine spring. But the specimen, according to analysis, was of sea water, and how did a brine spring of sea water get under the sea but through the process of evaporation on the surface, or by parting with a portion of its fresh water in some other way?

If we admit the principle assumed by Sir Charles Lyell, that water from the great pools and basins of the sea can never ascend to cross the ridges which form these pools and basins, then the harmonies of the sea are gone, and we are forced to conclude they never existed. Every particle of water that sinks below a submarine ridge is, *ipso facto*, by his reasoning, stricken from the channels of circulation, to become

* "From near its mouth at the Balize, a steam-boat may ascend for nearly two thousand miles with scarcely any perceptible difference in the width of the river."—*Lyell*, p. 263.

† "The Mississippi is continually shifting its course in the great alluvial plain, cutting frequently to the depth of one hundred, and even sometimes to the depth of two hundred and fifty feet."—*Lyell*, p. 273.

thenceforward forever motionless matter. The consequence would be "cold obstruction" in the depths of the sea, and a system of circulation between different seas of the waters only that float above the shoalest reefs and barriers. I do not believe in the existence of any such imperfect terrestrial mechanism, or in any such failures of design. To my mind, the proofs—the theoretical proofs—the proofs derived exclusively from reason and analogy—are as clear in favor of this under current from the Mediterranean as they were in favor of the existence of Leverrier's planet before it was seen through the telescope at Berlin.

Now suppose, as Sir Charles Lyell maintains, that none of these vast quantities of salt which this surface current takes into the Mediterranean find their way out again. It would not be difficult to show, even to the satisfaction of that eminent geologist, that this indraught conveys salt away from the Atlantic faster than all the *fresh*-water rivers empty fresh supplies of salt into the ocean. Now, besides this drain, vast quantities of salts are extracted from sea water for madrepores, coral reefs, shell banks, and marl beds; and by such reasoning as this, which is perfectly sound and good, we establish the existence of this under current, or else we are forced to the very unphilosophical conclusion that the sea must be losing its salts, and becoming less and less briny.

114. THE CURRENTS OF THE INDIAN OCEAN.—By carefully examining the physical features of this sea (Plates XVIII. and XIX.), and studying its conditions, we are led to look for warm currents that have their genesis in this ocean, and that carry from it volumes of overheated water, probably exceeding in quantity many times that which is discharged by the Gulf Stream from its fountains (Plate XVII.).

The Atlantic Ocean is open at the north, but tropical countries bound the Indian Ocean in that direction. The waters of this ocean are hotter than those of the Caribbean Sea, and the evaporating force there (§ 36) is much greater. That it is greater we might, without observation, infer from the fact of a higher temperature and a greater amount of precipitation on the neighboring shores (§ 33). These two facts, taken together, tend, it would seem, to show that large currents of warm water have their genesis in the Indian Ocean. One of them is the well-known Mozambique current, called at the Cape of Good Hope the Lagullas current.

115. Another of these currents makes its escape through the Straits of Malacca, and, being joined by other warm streams from the Java and China Seas, flows out into the Pacific, like another Gulf Stream, between the Philippines and the shores of Asia. Thence it attempts the great circle route for the Aleutian Islands, tempering climates, and losing itself in the sea on its route toward the northwest coast of America.

116. Between the physical features of this current and the Gulf Stream of the Atlantic there are several points of resemblance. Sumatra and Malacca correspond to Florida and Cuba; Borneo to the Bahamas, with the Old Providence Channel to the south, and the Florida Pass to the west. The coasts of China answer to those of the United States, the Philippines to the Bermudas, the Japan Islands to Newfoundland. As with the Gulf Stream, so also here with this China current, there is a counter-current of cold water between it and the shore. The climates of the Asiatic coast correspond with those of

America, along the Atlantic, and those of Columbia, Washington, and Vancouver are duplicates of those of Western Europe and the British Islands; the climate of California (State) resembling that of Spain; the sandy plains and rainless regions of Lower California reminding one of Africa, with its deserts between the same parallels, &c.

Moreover, the North Pacific, like the North Atlantic, is enveloped, where these warm waters go, with mists and fogs, and streaked with *lightning.* The Aleutian Islands are as renowned for fogs and mists as are the Grand Banks of Newfoundland.

A surface current flows north through Behring's Strait into the Arctic Sea; but, in the Atlantic, the current is from, not into the Arctic Sea: it flows south on the surface, north below; Behring's Strait being too shallow to admit of mighty under currents, or to permit the introduction from the polar basin of any large icebergs into the Pacific.

Behring's Strait, in geographical position, answers to Davis's Strait in the Atlantic; and Alaska, with its Aleutian chain of islands, to Greenland. But, instead of there being to the east of Alaska, as there is to the east of Greenland, an escape into the polar basin for these warm waters, the Pacific shore-line intervenes, and turns them down through a sort of North Sea along the western coast of the continent toward Mexico. And in this feature we may perceive why there cannot be in the North Pacific a Gulf Stream equal to that of the North Atlantic. The heat of the torrid and the cold of the frigid zone are perpetually destroying the equilibrium of the ocean, by changing with temperature the specific gravity of sea water; and the mere change of specific gravity there begets currents as surely as the change of weight at one end of the balance will cause it to kick the beam. The polar waters, having their specific gravity changed, seek the torrid zone by the North Sea and Davis's Strait; Behring's Strait is so shallow and so narrow that they cannot in sufficient volume get out that way, neither can large volumes of warm water enter the polar basin that way. Hence there is no call in the Pacific for a Gulf Stream like ours to supply the polar seas with intertropical waters.

117. These contrasts show the principal points of resemblance and of difference between the currents and aqueous circulation in the two oceans. The ice-bearing currents of the North Atlantic are not repeated as to degree in the North Pacific, for there is no nursery for icebergs like the Frozen Ocean and its arms. The seas of Okotsk and Kamtschatka alone, and not the frozen seas of the Arctic, cradle the icebergs for the North Pacific.

There is, at times at least, another current of warm water from the Indian Ocean. It finds its way south midway between Africa and Australia. The whales (Plate IX.) give indications of it. Nor need we be surprised at such a vast flow of warm water as these three currents indicate from the Indian Ocean, when we recollect that this ocean (§ 114) is land-locked on the north, and that the temperature of its waters is frequently as high as 90° Fahr.

There must, therefore, be immense volumes of water flowing into the Indian Ocean to supply the waste created by these warm currents, and the fifteen or twenty feet of water that observations tell us are yearly carried off from this ocean by evaporation.

On either side of this warm current that escapes from the inter-tropical parts of the Indian Ocean, midway between Africa and Australia, an ice-bearing current (Plate XIX.) is found wending its way from the Antarctic regions, with supplies of cold water, to modify climates and restore the aqueous equilibrium in that part of the world. These cold currents sometimes get as far north with their icebergs as 40° south. The Gulf Stream seldom permits them to get so near the equator as that in the North Atlantic, but I have known the ice-bearing current which passes east of Cape Horn into the South Atlantic to convey its bergs as far as the parallel of 37° south latitude. This is the nearest approach of icebergs to the equator.

118. These currents which run out from the inter-tropical basin of that immense sea—Indian Ocean—are active currents. They convey along immense volumes of water containing vast quantities of salt, and we know that sea water enough to convey back equal quantities of salt, and salt to keep up supplies for the outgoing currents, must flow into or return to the inter-tropical regions of the same sea; therefore, if observations were silent upon the subject, reason would teach us to look for currents here that keep in motion immense volumes of water.

119. The Currents of the Pacific.—The contrast has been drawn (§ 116) between the China or "Gulf Stream" of the North Pacific, and the Gulf Stream of the North Atlantic. The course of the China Stream has never been traced out. There is (Plate XIX.), along the coast of California and Mexico, a southwardly movement of waters, as there is along the west coast of Africa toward the Cape de Verde Islands.

In the open space west of this southwardly set along the African coast, there is the famous Sargasso Sea (Plate XIX.), which is the general receptacle of the drift-wood and sea-weed of the Atlantic. So, in like manner, to the west from California of this other southwardly set, lies the pool into which the drift-wood and sea-weed of the North Pacific are generally gathered.

The natives of the Aleutian Islands, where no trees grow, depend upon the drift-wood cast ashore there for all the timber used in the construction of their boats, fishing-tackle, and household gear. Among this timber, the camphor-tree, and other woods of China and Japan, are said to be often recognized. In this fact we have additional evidence touching this China Stream, as to which (§ 119) but little, at best, is known.

The Cold Asiatic Current.—Inshore of, but counter to the China current, along the eastern shores of Asia, is found (§ 116) a streak, or layer, or current of cold water answering to that between the Gulf Stream and the American coast. This current, like its fellow in the Atlantic, is not strong enough at all times sensibly to affect the course of navigation; but, like that in the Atlantic, it is the nursery of most valuable fisheries. The fisheries of Japan are quite as extensive as those of Newfoundland, and the people of each country are indebted for their valuable supplies of excellent fish to the cold waters which the currents of the sea bring down to their shores.

Humboldt's Current.—The currents of the Pacific are but little understood. Among those about which most is thought to be known is the Humboldt Current of Peru, which the great and good man

whose name it bears was the first to discover. It has been traced on Plate XIX. according to the best information—defective at best—upon the subject. This current is felt as far as the equator.

120. I have, I believe, discovered the existence of a warm current in the inter-tropical regions of the Pacific, midway between the American coast and the shore-lines of Australia.

This region affords an immense surface for evaporation. No rivers empty into it; the annual fall of rain, except in the "equatorial doldrums," is small, and the evaporation is all that both the northeast and the southeast trade-winds can take up and carry off. I have marked on Plate XIX. the direction of the supposed warm water current which conducts these overheated and briny waters from the tropics in mid ocean to the extra-tropical regions where precipitation is in excess. Here being cooled, and agitated, and mixed up with waters that are less salt, these overheated and over-salted waters from the tropics may be replenished and restored to their rounds in the wonderful system of oceanic circulation.

121. There are also about the equator in this ocean some curious currents which I do not understand, and as to which observations are not sufficient yet to afford the proper explanation or description. There are many of them, some of which, at times, run with great force. On a voyage from the Society to the Sandwich Islands, I encountered one running at the rate of ninety-six miles a day.

And what else should we expect in this ocean but a system of currents and counter-currents apparently the most uncertain and complicated? The Pacific Ocean and the Indian Ocean may, in the view we are about to take, be considered as one sheet of water. This sheet of water covers an area quite equal in extent to one-half of that embraced by the whole surface of the earth; and, according to Professor Alexander Keith Johnston, who so states it in the new edition of his splendid *Physical Atlas*, the total annual fall of rain on the earth's surface is one hundred and eighty-six thousand, two hundred and forty cubic imperial miles. Not less than three-fourths of the vapor which makes this rain comes from this waste of waters; but supposing that only half of this quantity, *i. e.* ninety-three thousand, one hundred and twenty cubic miles of rain falls upon this sea, and that that much, at least, is taken up from it again as vapor, this would give two hundred and fifty-five cubic miles as the quantity of water which is daily lifted up and poured back again into this expanse. It is taken up at one place and rained down at another, and in this process, therefore, we have agencies for multitudes of partial and conflicting currents, all, in their set and strength, apparently as uncertain as the winds.

The better to appreciate the operation of such agencies in producing currents in the sea, now here, now there, first this way, and then that, let us, by way of illustration, imagine a district of two hundred and fifty-five square miles in extent to be set apart in the midst of the Pacific Ocean, as the scene of operations for one day. We must now conceive a machine capable of pumping up, in the twenty-four hours, all the water to the depth of one mile in this district. The machine must not only pump up and bear off this immense quantity of water, but it must discharge it again into the sea on the same day, but at some other place. Now here is a force for creating currents that is equivalent in its results to the effects that would be produced by baling up, in twenty-four hours, two hundred and fifty-five cubic miles of water from one part of the Pacific Ocean, and emptying it out again upon another part. The currents

that would be created by such an operation would overwhelm navigation and desolate the sea; and, happily for the human race, the great atmospherical machine, which actually does perform every day, on the average, all this lifting up, transporting, and letting down of water upon the face of the grand ocean, does not confine itself to an area of two hundred and fifty-five square miles, but to an area three hundred thousand times as great; yet, nevertheless, the same quantity of water is kept in motion, and the currents, in the aggregate, transport as much water to restore the equilibrium as they would have to do were all the disturbance to take place upon our hypothetical area of one mile deep over the space of two hundred and fifty-five square miles. Now when we come to recollect that evaporation is lifting up, that the winds are transporting, and that the clouds do let down every day actually such a body of water, but that it is done by little and little at a place, and by hair's breadths at a time, not by parallelopipedons one mile thick—that the evaporation is most rapid and the rains most copious, not always at the same place, but now here, now there, we shall see actually existing in nature a force sufficient to give rise to just such a system of currents as that which mariners find in the Pacific—currents which appear to rise in mid ocean, run at unequal rates, sometimes east, sometimes west, but which always lose themselves where they rise, viz: in mid ocean.

UNDER CURRENTS.—Lieutenant J. C. Walsh, in the United States schooner Taney, and Lieutenant S. P. Lee, in the United States brig Dolphin, both, while they were carrying on a system of observations in connection with the Wind and Current Charts, had their attention directed to the subject of submarine currents.

They made some interesting experiments upon the subject. A block of wood was loaded to sinking, and, by means of a fishing-line or a bit of twine, let down to the depth of one hundred or five hundred fathoms (six hundred or three thousand feet). A small float, just sufficient to keep the block from sinking further, was then tied to the line, and the whole let go from the boat.

To use their own expressions, "It was wonderful, indeed, to see this *barrega* move off, against wind, and sea, and surface current, at the rate of over one knot an hour, as was generally the case, and on one occasion as much as 1¾ knots. The men in the boat could not repress exclamations of surprise, for it really appeared as if some monster of the deep had hold of the weight below, and was walking off with it."* Both officers and men were amazed at the sight.

122. The experiments in deep-sea soundings have also thrown much light upon the subject of under currents. There is reason to believe that they exist in all, or almost all parts of the deep sea, for never in any instance yet has the deep-sea line ceased to run out, even after the plummet had reached the bottom.

If the line be held fast in the boat, it invariably parts, showing, when two or three miles of it are out, that the under currents are sweeping against the bight of it with what seamen call a *swigging force*, that no sounding twine has yet proved strong enough to withstand.

Lieutenant J. P. Parker, of the United States frigate Congress, attempted, in 1852, a deep-sea sounding

* Lieutenant Walsh.

off the coast of South America. He was engaged with the experiment eight or nine hours, during which time a line nearly ten miles long was paid out. Night coming on, he had to part the line (which he did simply by attempting to haul it in), and return on board. Examination proved that the ocean there, instead of being over ten miles in depth, was not over three, and that the line was swept out by the force of one or more under currents. But in what direction these currents were running is not known.

123. It may, therefore, without doing any violence to the rules of philosophical investigation, be conjectured, that the equilibrium of all the seas is preserved, to a greater or less extent, by this system of currents and counter-currents at and below the surface.

If we except the tides, and the partial currents of the sea, such as those that may be created by the wind, we may lay it down as a rule that all the currents of the ocean owe their origin to difference of specific gravity between sea water at one place and sea water at another; for wherever there is such a difference, whether it be owing to difference of temperature or to difference of saltness, &c., it is a difference that disturbs equilibrium, and currents are the consequence. The heavier water goes toward the lighter, and the lighter whence the heavier comes; for two fluids differing in specific gravity (§ 36), and standing at the same level, cannot balance each other. It is immaterial, as before stated, whether this difference of specific gravity be caused by temperature, by the matter held in solution, or by any other thing; the effect is the same, namely, a current.

That the sea, in all parts, holds in solution the same kind of solid matter; that its waters in this place, where it never rains, are not salter than the strongest brine; and that in another place, where the rain is incessant, they are not entirely without salt, may be taken as evidence in proof of a system of currents or of circulation in the sea, by which its waters are shaken up and kept mixed together as though they were in a phial. Moreover, we may lay it down as a law in the system of oceanic circulation, that every current in the sea has its counter-current; in other words, that the currents of the sea are, like the nerves of the human system, arranged in pairs; for wherever one current is found carrying off water from this or that part of the sea, to the same part must some other current convey an equal volume of water, or else the first would, in the course of time, cease for the want of water to supply it.

124. Currents of the Atlantic.—The principal currents of the Atlantic have been described in the chapter on the Gulf Stream. Besides this, its eddies and its offsets, are the equatorial current (Plate XVII.), and the St. Roque or Brazil Current. Their fountain-head is the same. It is in the warm waters about the equator, between Africa and America. The former, receiving the Amazon and the Oronoco as tributaries by the way, flows into the Caribbean Sea, and becomes with the waters in which the vapors of the trade-winds leave their salts, the feeder of the Gulf Stream. The Brazil Current, coming from the same fountain, is supposed to be divided by Cape St. Roque, one branch going to the south under this name (Plate XIX.), the other to the westward. This last has been a great bugbear to navigators, principally on account of the difficulties which a few dull vessels falling to leeward of St. Roque have found in beating up against it. It was said to have caused the loss of some English transports in the last

century, which fell to leeward of the Cape on a voyage to the other hemisphere; and navigators, accordingly, were advised to shun it as a danger.

125. This current has been an object of special investigation during my researches connected with the Wind and Current Charts, and the result has satisfied me that it is neither a dangerous nor a constant current, notwithstanding older writers. Horsburgh, in his *East India Directory*, cautions navigators against it; and Keith Johnston, in his grand *Physical Atlas*, published in 1848, thus speaks of it:—

"This current greatly impedes the progress of those vessels which cross the equator west of 23° west longitude, impelling them beyond Cape St. Roque, when they are drawn toward the northern coast of Brazil, and cannot regain their course till after weeks or months of delay and exertion."

So far from this being the case, my researches abundantly prove that vessels which cross the equator five hundred miles to the west of longitude 23° west, have no difficulty on account of this current in clearing that cape. I receive almost daily the abstract logs of vessels that cross the equator west of 30° west, and in three days from that crossing they are generally clear of that cape. A few of them report the current in their favor; most of them experience no current at all; but, now and then, some do find a current setting to the northward and westward, and operating against them at the rate of twenty miles a day. The inter-tropical regions of the Atlantic, like those of the other oceans (§ 121), abound with conflicting currents, which no researches yet have enabled the mariner to unravel so that he may at all times know where they are and tell how they run, in order that the navigator may be certain of their help when favorable, or sure of avoiding them if adverse.

I may here remark, that there seems to be a larger flow of polar waters into the Atlantic than of other waters from it, and I cannot account for the preservation of the equilibrium of this ocean by any other hypothesis than that which calls in the aid of under currents. They, I have no doubt, bear an important part in the system of oceanic circulation.

Admiral Sir Francis Beaufort, the venerable hydrographer of England, made, when in command of her Britannic Majesty's frigate Frederiksteen, in the Mediterranean, some interesting experiments upon under currents, which I should be glad to see repeated in other parts of the sea, especially between the tropics, in the Atlantic, Pacific, and Indian Oceans, and wherever the water is remarkably transparent. That officer says:—

"The counter-currents, or those which return beneath the surface of the water, are also very remarkable; in some parts of the Archipelago they are at times so strong as to prevent the steering of the ship; and, in one instance, on sinking the lead, when the sea was calm and clear, with shreds of bunting of various colors attached to every yard of the line, they pointed in different directions all around the compass."

The Gulf Stream is unique; it is the anomaly of the sea; its bearings upon commerce and navigation are highly important—a separate chapter will be devoted to it in this light.

CHAPTER VIII.

THE GULF STREAM.*

Its color, § 126.—The Sargasso Sea, 129.—Galvanic Properties of Gulf Stream Waters, 130.—Agents that make Water in one part of the Sea heavier than in another, 132.—Temperature of the Gulf Stream, 136.—Why the Drift Matter of the Gulf Stream is sloughed off to the right of its Course, 138.—Currents run along arcs of Great Circles, 142.—The Force derived from Changes of Temperature, 143.—Limits of the Gulf Stream for March and September, 144.—A Cushion of Cold Water between the Bottom of the Sea and the Waters of the Gulf Stream, 145.—It runs up hill, 146.

§ 126. The water of the Gulf Stream, as far out from the Gulf as the Carolina coasts, is of an indigo blue. It is so distinctly marked, that the line of junction with the common sea water may be traced by the eye. Often one-half of the vessel may be perceived floating in Gulf Stream water, while the other half is in common water of the sea; so sharp is the line, and such the want of affinity between those waters, and the reluctance, on the part of those of the Gulf Stream, to mingle with the common water of the sea.

What is the cause of the Gulf Stream has always puzzled philosophers. Modern investigations and examinations are beginning to throw some light upon the subject, though all is not yet clear.

1. Early writers maintained that the Mississippi River was the father of the Gulf Stream. Its floods, they said, produce it; for its velocity, it was held, could be computed by the rate of the current of the river.

Captain Livingston overturned this hypothesis by showing that the volume of water which the Mississippi River empties into the Gulf of Mexico is only equal to about the three-thousandth part of that which escapes from it through the Gulf Stream.

2. Moreover, the water of the Gulf Stream is salt—of the Mississippi, fresh; and those philosophers forgot that just as much salt as escapes from the Gulf of Mexico through this stream, must enter the Gulf through some other channel from the main ocean; for, if it did not, the Gulf of Mexico, unless it had a salt-bed at the bottom, or was fed with salt-springs below—neither of which is probable—would, in process of time, become a fresh-water basin.

The above quoted argument of Captain Livingston, however, was held to be conclusive; and upon the remains of the hypothesis which he had so completely overturned, he set up another, which, in turn, has been upset. In it he ascribed the velocity of the Gulf Stream as depending "on the motion of the sun in the ecliptic, and the influence he has on the waters of the Atlantic."

But the opinion that came to be the most generally received and deep rooted in the mind of seafaring people was the one repeated by Dr. Franklin, and which held that the Gulf Stream is the escaping of the

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* *Vide* Maury's Physical Geography of the Sea.

waters that have been *forced* into the Caribbean Sea by the trade-winds, and that it is the pressure of those winds upon the water which forces up into that sea a head, as it were, for this stream.

We know of instances in which waters have been accumulated on one side of a lake, or in one end of a canal, at the expense of the other. But they are rare, sudden, and partial, and, for the most part, confined to sheets of shoal water where the ripples are proportionably great. As far as they go, the pressure of the trade-winds may *assist* to give the Gulf Stream its initial velocity, but is it of itself adequate to such an effect? To my mind, the laws of hydrostatics, as at present expounded, appear by no means to warrant the conclusion that it is, unless the aid of other agents also be brought to bear.

Admiral Smyth, in his valuable memoir on the Mediterranean (p. 162), mentions that a continuance in the Sea of Tuscany of *gusty gales* from the southwest has been known to raise its surface no less than twelve feet above its ordinary level. This, he says, occasions a strong surface drift through the Strait of Bonifaccio. But in this we have nothing like the Gulf Stream; no deep and narrow channel way to conduct these waters off like a miniature river even in the sea, but a mere surface flow, such as usually follows the piling up of water in any pond or gulf above the ordinary level. The Bonifaccio current does not flow like a river in the sea across the Mediterranean, but it spreads itself out as soon as it passes the Straits, and, like a circle on the water, loses itself by broad spreading as soon as it gets to sea.

127. Supposing the pressure of the waters that are *forced* into the Caribbean Sea by the trade-winds to be the *sole* cause of the Gulf Stream, that sea and the Mexican Gulf should have a much higher level than the Atlantic. Accordingly, the advocates of this theory require for its support "a great degree of elevation." Major Rennell likens the stream to "an immense river descending from a higher level into a plain." Now we know very nearly the average breadth and velocity of the Gulf Stream in the Florida Pass. We also know, with a like degree of approximation, the velocity and breadth of the same waters off Cape Hatteras. Their breadth here is about seventy-five miles against thirty-two in the "Narrows" of the Straits, and their mean velocity is three knots off Hatteras against four in the "Narrows." This being the case, it is easy to show that the depth of the Gulf Stream off Hatteras is not so great as it is in the "Narrows" of Bemini by nearly 50 per cent., and that, consequently, instead of *descending*, its bed represents the surface of an inclined plane tilted down from the north, and *up* which the lower depths of the stream *must* ascend. If we assume its depth off Bemini to be two hundred fathoms, which are thought to be within limits, the above rates of breadth and velocity will give one hundred and fourteen fathoms for its depth off Hatteras. The waters, therefore, which in the Straits are below the level of the Hatteras depth, so far from descending, are actually forced up an inclined plane, whose submarine ascent is not less than ten inches to the mile.

The Niagara is an "immense river descending into a plain." But instead of preserving its character in Lake Ontario as a distinct and well-defined stream for several hundred miles, it spreads itself out, and its waters are immediately lost in those of the lake. Why should not the Gulf Stream do the same? It gradually enlarges itself, it is true; but, instead of mingling with the ocean by broad spreading, as the

"immense rivers" descending into the northern lakes do, its waters, like a stream of oil in the ocean, preserve a distinctive character for nearly three thousand miles.

128. Moreover, while the Gulf Stream is running to the north from its supposed elevated level at the south, there is a cold current coming down from the north; meeting the warm waters of the Gulf midway the ocean, it divides itself, and runs by the side of them right back into those very reservoirs at the south, to which theory gives an elevation sufficient to send out entirely across the Atlantic a jet of warm water said to be more than three thousand times greater in volume than the Mississippi River. This current from Baffin's Bay has not only no trade-winds to give it a head, but the prevailing winds are unfavorable to it, and for a great part of the way it is below the surface, and far beyond the propelling reach of any wind. And there is every reason to believe that this polar current is quite equal in volume to the Gulf Stream. Are they not the effects of like causes? If so, what have the trade-winds to do with the one more than the other?

It is a custom often practised by seafaring people to throw a bottle overboard, with a paper, stating the time and place at which it is done. In the absence of other information as to currents, that afforded by these mute little navigators is of great value. They leave no tracks behind them, it is true, and their routes cannot be ascertained. But knowing where they were cast, and seeing where they are found, some idea may be formed as to their course. Straight lines may at least be drawn, showing the shortest distance from the beginning to the end of their voyage, with the time elapsed. Captain, now Admiral Beechey, R. N., has prepared a chart, representing, in this way, the tracks of more than one hundred bottles. From it, it appears that the waters from every quarter of the Atlantic tend toward the Gulf of Mexico and its stream. Bottles cast into the sea midway between the Old and the New Worlds, near the coasts of Europe, Africa, and America, at the extreme north or furthest south, have been found, either in the West Indies or within the well-known range of Gulf Stream waters.

Of two cast out together in south latitude on the coast of Africa, one was found on the island of Trinidad; the other on Guernsey, in the English Channel.

In the absence of positive information on the subject, the circumstantial evidence that the latter performed the tour of the Gulf is all but conclusive.

Another bottle, thrown over off Cape Horn by an American master in 1837, has been recently picked up on the coast of Ireland. An inspection of the chart, and of the drift of the other bottles, seems to *force* the conclusion that this bottle too went even from that remote region to the so-called *higher* level of the Gulf Stream reservoir.

129. Midway the Atlantic, in the triangular space between the Azores, Canaries, and the Cape de Verde Islands, is the Sargasso Sea. (Plate XVII.) Covering an area equal in extent to the Mississippi Valley, it is so thickly matted over with Gulf weed (*fucus natans*), that the speed of vessels passing through it is often much retarded. When the companions of Columbus saw it, they thought it marked the limits of navigation, and became alarmed. To the eye, at a little distance, it seems substantial enough to walk upon. Patches of the weed are always to be seen floating along the Gulf Stream. Now, if bits

of cork or chaff, or any floating substance, be put into a basin, and a circular motion be given to the water, all the light substances will be found crowding together near the centre of the pool, where there is the least motion. Just such a basin is the Atlantic Ocean to the Gulf Stream, and the Sargasso Sea is the centre of the whirl. Columbus first found this weedy sea in his voyage of discovery; there it has remained to this day; and certain observations as to its limits, extending back for fifty years, assure us that its position has not been altered since that time. This indication of a circular motion by the Gulf Stream is corroborated by the bottle chart and other sources of information. If, therefore, this be so, why give the endless current a higher level in one part of its course than another?

Nay, more; at the very season of the year when the Gulf Stream is rushing in greatest volume through the Straits of Florida, and hastening to the north with the greatest rapidity, there is a cold stream from Baffin's Bay, Labrador, and the coasts of the north, running to the south with equal velocity. Where is the trade-wind that gives the high level to Baffin's Bay, or that even presses upon, or assists to put this current in motion? The agency of winds in producing currents in the deep sea must be very partial. These two currents meet off the Grand Banks, where the latter is divided. One part of it underruns the Gulf Stream, as is shown by the icebergs which are carried in a direction tending across its course. The probability is, that this "fork" continues on toward the south, and runs into the Caribbean Sea, for the temperature of the water at a little depth there has been found far below the mean temperature of the earth, and quite as cold as at a corresponding depth off the Arctic shores of Spitzbergen.

More water cannot run from the equator or the pole than to it. If we make the trade-winds cause the former, some other wind must produce the latter; but these, for the most part, and for great distances, are *submarine*, and therefore beyond the influence of winds. Hence it should appear that *winds* have little to do with the general system of aqueous circulation in the ocean.

The other "fork" runs between us and the Gulf Stream to the south, as already described. As far as it has been traced, it warrants the belief that it, too, runs *up* to seek the so-called *higher* level of the Mexican Gulf.

The power necessary to overcome the resistance opposed to such a body of water as that of the Gulf Stream, running several thousand miles without any renewal of impulse from the forces of gravitation or any other known cause, would be truly surprising.

The facts so far derived from observation, afford us at best but a mere glimmer of light, by no means sufficient to make any mind clear as to a *higher level* of the Gulf, or as to the sufficiency of any other of the causes assigned for this wonderful stream. If it be necessary to resort to a higher level in the Gulf to account for the velocity off Hatteras, I cannot perceive why we should not, with like reasoning, resort to a higher level off Hatteras also to account for the velocity off the Grand Banks, and thus make the Gulf Stream, throughout its circuit, a *descending* current, and, by the *reductio ad absurdum*, show that the trade-winds are not adequate to the effect ascribed.

When facts are wanting, it often happens that hypothesis will serve, in their stead, all the purposes of

mere illustration. Let us, therefore, suppose a globe of the earth's size, having a solid nucleus, and covered all over with water two hundred fathoms deep; and that every source of heat and cause of radiation be removed, so that its fluid temperature becomes constant and uniform throughout. On such a globe, the equilibrium remaining undisturbed, there would be neither wind nor current.

Let us now suppose that all the water within the tropics, to the depth of one hundred fathoms, suddenly becomes oil. The aqueous equilibrium of the planet is thereby disturbed, and a general system of currents and counter-currents is immediately commenced—the oil, in an unbroken sheet on the surface, running toward the poles, and the water, in an under current, toward the equator. The oil is supposed, as it reaches the polar basin, to be reconverted into water, and the water to become oil as it crosses Cancer and Capricorn, rising to the surface and returning as before.

Thus, *without wind*, we should have a perpetual and uniform system of tropical and polar currents. In consequence of diurnal rotation of the planet on its axis, each particle of oil, were resistance small, would approach the poles on a spiral turning to the east, with a relative velocity greater and greater, until, finally, it would reach the pole and whirl about it at the rate of nearly a thousand miles the hour. Becoming water, and losing its velocity, it would approach the tropics by a similar, but inverted spiral, turning toward the west. Owing to the principle here alluded to, all currents from the equator to the poles should have an eastward tendency, and all from the poles toward the equator a westward.

Let us now suppose the solid nucleus of this hypothetical globe to assume the exact form and shape of the bottom of our seas, and in all respects, as to figure and size, to represent the shoals and islands of the sea, as well as the coast lines and continents of the earth. The uniform system of currents just described would now be interrupted by obstructions and local causes of various kinds, such as unequal depth of water, contour of shore-lines, &c.; and we should have at certain places currents greater in volume and velocity than at others. But still there would be a system of currents and counter-currents to and from either pole and the equator. Now, do not the cold waters of the north, and the warm waters of the Gulf, made specifically lighter by tropical heat, which we see actually preserving such a system of counter-currents, hold, at least in some degree, the relation of the supposed water and oil?

In obedience to the laws here hinted at, there is a constant tendency of polar waters toward the tropics, and of tropical waters toward the poles. Captain Wilkes, of the United States Exploring Expedition, crossed one of these hyperborean under currents two hundred miles in breadth at the equator.

Assuming the maximum velocity of the Gulf Stream at five knots, and its depth and breadth in the Narrows of Bemini as before (§ 127), the vertical section across would present an area of two hundred millions of square feet moving at the rate of seven feet three inches per second. The difference of specific gravity between the volume of Gulf water that crosses this sectional line in one second, and an equal volume of water at the ocean temperature of the latitude, is fifteen millions of pounds. If these estimated dimensions (assumed merely for the purposes of illustration) be within limits, the then force per second,

operating here to propel the waters of the Gulf toward the pole, is the equilibrating tendency due to fifteen millions of pounds of water in the latitude of Bemini.

In investigating the currents of the seas, such agencies should be taken into account. I doubt whether this one is sufficient of itself to produce a stream of such great velocity as that of the Gulf; for, assuming its estimated discharge to be correct, the proposition is almost susceptible of mathematical demonstration, that to overcome the resistance opposed in consequence of its velocity would require a force at least sufficient to drive, at the rate of three miles the hour, ninety thousand millions of tons up an inclined plane having an ascent of three inches to the mile.* Yet the very principle from which this agent is derived is admitted to be one of the chief causes of those winds which are said to be the sole cause of this current.

130. The chemical properties, or, if the expression be admissible, the *galvanic* properties of the Gulf Stream waters, as they come from their fountains, are different, or, rather, more intense than they are in sea water generally.

In 1843, the Secretary of the Navy took measures for procuring a series of observations and experiments with regard to the corrosive effects of sea water upon the copper sheathing of ships. With patience, care, and labor, these researches were carried on for a period of ten years; and it is said the fact has been established, that the copper on the bottom of ships cruising in the Caribbean Sea and Gulf of Mexico suffers more from the action of sea water upon it than does the copper of ships cruising in any other part of the ocean. In other words, the salts of these waters create the most powerful galvanic battery that is found in the ocean.

131. Now it may be supposed—other things being equal—that the strength of this galvanic battery in the sea depends, in some measure, upon the proportion of salts that the sea waters hold in solution.

If, therefore, in the absence of better information, this suggestion be taken as a probability, we may go a step further, and draw the inference that the waters of the Gulf Stream, as they rush out in such volume and with such velocity into the Atlantic, have not only chemical affinities peculiar to themselves, but, having more salts, they are therefore specifically heavier than the sea water through which they flow in such a clear and well-defined channel.

The affinities of which I speak, and which are manifested in the reluctance of the Gulf Stream to mingle its waters with those of the ocean (§ 126), may be the resultant of their galvanic properties, higher temperature, and greater degree of saltness, all combined.

If the story told by the copper (§ 130) be taken to mean a higher point of saturation with salts, and, consequently, a greater specific gravity for the waters of the Gulf and Caribbean Sea than for the waters of the broad ocean at the same temperature, then we should have as a source for the initial velocity of the Gulf Stream, not, indeed, a higher level of the waters in the Gulf, but a greater density.

Now a greater density, implying, of course, a greater specific gravity, would serve, as well as a higher

* Supposing there be no resistance from friction.

level, to impart an initial velocity, but with this difference: the heavier waters would, by reason of their greater pressure, be ejected through the most convenient aperture out into the ocean of lighter waters by a sort of *squirting* force. But what, it may be asked, should make the waters of the Mexican Gulf and Caribbean Sea salter than the waters of like temperature in those parts of the ocean through which the Gulf Stream flows?

132. There are physical agents that are known to be at work in different parts of the ocean, the tendency of which is to make the waters in one part of the ocean salter and heavier, and in another part lighter and less salt than the average of sea water. These agents are those employed by sea-shells in secreting solid matter for their structures, also of heat* and radiation, evaporation and precipitation.

In the trade-wind regions at sea (Plate XVIII.), evaporation is generally in excess of precipitation, while in the extra-tropical regions the reverse is the case; that is, the clouds let down more water than the winds take up again; and these are the regions in which the Gulf Stream enters the Atlantic.

133. Along the shores of India, where experiments have been carefully made, the evaporation amounts to three-fourths of an inch daily. Suppose it in the trade-wind region of the Atlantic to amount to only half an inch, that would give an annual evaporation of say fifteen feet. In the process of evaporation from the sea, fresh water only is taken up, the salts are left behind.

Now a layer of sea water fifteen feet deep, and as broad as the trade-wind belts of the Atlantic, and reaching across the ocean, contains an immense amount of salts.

134. The great equatorial current (Plate XVII.) which sweeps from the shores of Africa across the Atlantic into the Caribbean Sea is a surface current; and may it not bear into that sea a large portion of those waters that have satisfied the thirsty trade-winds with saltless vapor? If so—and it probably does—have we not detected here the foot-prints of an agent that does tend to make the waters of the Caribbean Sea salter, and therefore heavier than the average of sea water?

It is immaterial, so far as the correctness of the principle upon which this reasoning depends is concerned, whether the annual evaporation from the trade-wind regions of the Atlantic be fifteen, ten, or five feet. The layer of water, whatever be its thickness, that is evaporated from this part of the ocean, is not all poured back by the clouds in the same place whence it came. But they take it and pour it down in showers upon the extra-tropical regions of the earth—on the land as well as in the sea—where, as a rule, more water is let down than is taken up into the clouds again. Suppose the excess of precipitation in these extra-tropical regions of the sea amounts to but twelve inches, or even to but two, it is twelve inches or two inches, as the case may be, of fresh water added to the sea in those parts, and which, therefore, tends to lessen the specific gravity of sea water there to that extent; and for the simple reason, that what is taken from one scale, by being put into the other, reduplicates the difference.

Now, that we may form some idea as to the influence which the salts left by the vapor that the trade-winds, northeast and southeast, take up from sea water, is calculated to exert in creating currents, let us

* According to Doctor Marcet, sea water contracts down to 28°.

make a partial calculation to show how much salt this vapor held in solution before it was taken up, and, of course, while yet in the state of sea water. The northeast trade-wind regions of the Atlantic embrace an area of at least three million square miles; and the yearly evaporation from it is (§ 133), we will suppose, fifteen feet. The salt that is contained in a mass of sea water, covering to the depth of fifteen feet an area of three million square miles in superficial extent, would be sufficient to cover the British islands to the depth of fourteen feet. As this water supplies the trade-winds with vapor, it therefore becomes salter, and as it becomes salter, the forces of aggregation among its particles are increased, as we may infer from the fact (§ 131) that the waters of the Gulf Stream are reluctant to mix with those of the ocean.

Now, whatever may be the cause that enables these waters to remain on the surface, whether it be from the fact just stated, and in consequence of which the waters of the Gulf Stream are held together in their channel; or whether it be from the fact that the expansion from the heat of the torrid zone is sufficient to compensate for this increased saltness; or whether it be from both of these influences together that these waters are kept on the surface, suffice it to say, we do know that they go into the Caribbean Sea (§ 134) as a surface current. The trade-winds, by their constant force, may assist to skim them off from the Atlantic, and push them along into the Caribbean Sea, whence, for causes unknown, they escape by the channel of the Gulf Stream in preference to any other.

135. In the present state of our knowledge concerning this wonderful phenomenon—for the Gulf Stream is one of the most marvellous things in the ocean—we can do little more than conjecture. But we have two causes in operation which we may safely assume are among those concerned in producing the Gulf Stream. One of these is in the increased saltness of its water after the trade-winds have been supplied with vapor from it; and the other is in the diminished quantum of salt which the Baltic and the North Sea contain. The waters of the Baltic are nearly fresh; they contain only about half as much salt as sea water does generally.

Now here we have, on one side, the Caribbean Sea and Gulf of Mexico, with their waters of brine; on the other, the Baltic and the North Sea, with waters that are but little more than brackish. In one set of these sea-basins the water is heavy; in the other, it is light. Between them the ocean intervenes; but water is bound to seek and to maintain its level; and here, therefore, we unmask one of the agents concerned in causing the Gulf Stream. What is the influence of this agent—that is, how great is it, and to what extent does it go—we cannot say; only it is at least one of the agents concerned. Moreover, speculate as we may as to all the agencies concerned in collecting these waters, that have supplied the trade-winds with vapor, into the Caribbean Sea, and then in driving them across the Atlantic, of this we may be sure, that the salt which the trade-wind vapor leaves behind in the tropics has to be conveyed away from the trade-wind region, to be mixed up again in due proportion with the other water of the sea—the Baltic included—and that these are the waters which we see running off through the Gulf Stream. To convey them away is one of the offices which, in the economy of the ocean, has been assigned to it.

136. As to the temperature of the Gulf Stream, there is, in a winter's day, off Hatteras, and even as

high up as the Grand Banks in mid ocean, a difference between its waters and those of the ocean of nearly 20°, and even 30°. Water, we know, expands by heat, and here the difference of temperature may more than compensate for the difference of saltness, and leave, therefore, the waters of the Gulf lighter by reason of their warmth.

137. Being lighter and adhesive, they should therefore occupy a higher level than those through which they flow. Assuming the depth off Hatteras to be one hundred and fourteen fathoms, and allowing the usual rates of expansion for sea water, figures show that the middle or axis of the Gulf Stream there should be nearly two feet higher than the contiguous waters of the Atlantic. Hence the surface of the stream should present a double inclined plane, from which the water would be running down on either side, as from the roof of a house. As this runs off at the top, the same weight of colder water runs in at the bottom, and so raises up the cold-water bed of the Gulf Stream, and causes it to become shallower and shallower as it goes north.

That the Gulf Stream is roof-shaped, causing the waters on its surface to flow off to either side from the middle, we have not only circumstantial evidence to show, but observations to prove.

Navigators, while drifting along with the Gulf Stream, have lowered a boat to try the surface current. In such cases, the boat would drift either to the east or to the west, as it happened to be on one side or the other of the axis of the stream, while the vessel herself would drift along with the stream in the direction of its course; thus showing the existence of a shallow roof-current from the middle toward either edge, which would carry the boat along, but which, being superficial, does not extend deep enough to affect the drift of the vessel.

That such is the case (§ 137), is also indicated by the circumstance that the sea-weed and drift-wood which are found in such large quantities along the outer edge of the Gulf Stream, are never, even with the prevalence of easterly winds, found along its inner edge, and for the simple reason that to cross the Gulf Stream, and to pass over from that side to this, they would have to drift up stream, as it were; that is, they would have to stem this roof-current until they reached the middle of the stream. We never hear of planks, or wrecks, or of any floating substance which is cast into the sea on the other side of the Gulf Stream being found along the coasts of the United States. Drift-wood, trees, and seeds from the West India Islands, are said to have been cast up on the shores of Europe, but never, that I ever heard, on the Atlantic shores of this country.

We are treating now of the effects of physical causes. The question to which I ask attention is, Why does the Gulf Stream slough off and cast upon its outer edge sea-weed, drift-wood, and all other solid bodies that are found floating upon it?

138. One cause has been shown to be in its roof-shaped current; but there is another which tends to produce the same effect, and because it is a physical agent, it should not, in a treatise of this kind, be overlooked, be its action never so slight. I allude now to the effects (upon the drift matter of the stream) produced by the diurnal rotation of the earth.

Take, for illustration, a railroad that runs north and south. It is well known to engineers, that when

the cars are going north on such a road, their tendency is to run off on the east side; but when the train is going south, their tendency is to run off on the west side of the track—*i. e.* always on the right-hand side. Whether the road be one mile or one hundred miles in length, the effect of diurnal rotation is the same, and the tendency to run off, as you cross a given parallel at a stated rate of speed, is the same, whether the road be long or short, the tendency to fly the track being in proportion to the speed of the trains, and not at all in proportion to the length of the road.

Now, *vis inertiæ* and velocity being taken into the account, the tendency to obey the force of this diurnal rotation, and to trend to the right, is proportionably as great in the case of a patch of sea-weed as it drifts along the Gulf Stream, as it is in the case of the train of cars as they speed to the north, along the iron track of the Hudson River Railway, or the Great Western Railway of England.

The rails restrain the cars and prevent them from flying off; but there are no rails to restrain the sea-weed, and nothing to prevent the drift matter of the Gulf Stream from going off in obedience to this force. The slightest impulse tending to turn aside bodies moving freely in water is immediately felt and implicitly obeyed.

139. It is in consequence of this diurnal rotation that drift-wood coming down the Mississippi is so very apt to be cast upon the west or right bank. This is the reverse of what obtains upon the Gulf Stream, for it flows to the north; it therefore sloughs off to the east.

The effect of diurnal rotation upon the winds and upon the currents of the sea is admitted by all; the trade-winds derive their *easting* from it. It must, therefore, extend to all the matter which these currents bear with them—to the largest iceberg as well as to the merest sprig of grass that floats upon the waters, or the minutest organism that the most powerful microscope can detect among the impalpable particles of sea-dust. This effect of diurnal rotation will be frequently alluded to in the pages of this work.

140. In its course to the north, the Gulf Stream gradually trends more and more to the eastward, until it arrives off the Banks of Newfoundland, where its course becomes due east. These Banks, it has been thought, deflect it from its proper course, and cause it to take this turn. Examination will prove, I think, that they are an effect, certainly not the cause. It is here that the frigid current already spoken of (§ 128), with its icebergs from the north, are met and melted by the warm waters of the Gulf. Of course the loads of earth, stones, and gravel brought down upon them are here deposited. Captain Scoresby, far away in the north, counted five hundred icebergs setting out from the same vicinity upon this cold current for the south. Many of them, loaded with earth, have been seen aground on the Banks. This process of transferring deposits for these shoals has been going on for ages; and, with time, seems altogether adequate to the effect described.

The deep-sea soundings that have been made by vessels of the navy (Plate XIV.) tend to confirm this view as to the formation of these Banks. The greatest contrast in the bottom of the Atlantic is just to the south of these Banks. Nowhere, in the open sea, has the water been found to deepen so suddenly as here. Coming from the north, the bottom of the sea is shelving; but suddenly, after passing these Banks,

its depth increases by almost a precipitous descent for many thousand feet, thus indicating that the debris which forms the Grand Banks comes from the north.

141. From the Straits of Bemini the course of the Gulf Stream (Plate XVII.) describes (as far as it can be traced over toward the British Islands which are in the midst of its waters) the arc of a great circle as nearly as may be, only the thread or axis of the Gulf Stream does not generally go quite as far north as the great circle would. Such a course as this is the course that a cannon ball, could it be shot from these straits to those islands, would take.

If it were possible to see Ireland from Bemini, and to get a cannon that would reach that far, the person standing on Bemini and taking aim, intending to shoot at Ireland as a target, would, if the earth were at rest, sight along the plane of a great circle, for the path of the ball would be in such a plane.

But there *is* diurnal rotation; the earth *does* revolve on its axis; and since Bemini is nearer than Ireland is to the equator, the gun would be moving in diurnal rotation faster than the target, and therefore the marksman, taking aim point blank at his target, would miss. He would find, on examination, that he had shot ahead of his mark. In other words, that the path actually described by the ball would not be an arc of a great circle, and that the highest parallel reached by the ball in its flight would not be as far north as the highest parallel touched by the great circle, and that, consequently, the path of the ball would take a due east course before the track of the great circle would.

It is the case of the passenger in the railroad car throwing an apple, as the train sweeps by, to a boy standing by the wayside. If he throw straight at the boy, he will miss, for the apple, partaking of the motion of the cars, will go ahead of the boy, and for the very reason that the shot will pass in advance of the target, for both the marksman and the passenger are going faster than the object at which they aim.

142. Hence we may assume it as a law, that the natural tendency of all currents in the sea, like the natural tendency of all projectiles through the air, is to describe their curves of flight in the planes of great circles, departing therefrom—unless *forced* to depart by obstructions—only so much as the forces of diurnal rotation may impel.

The arc of a great circle is the shortest distance between any two points on the surface of a sphere. Light, heat, and electricity, running water, and all substances, whether ponderable or imponderable, seek, when in motion, to pass from point to point by the shortest lines practicable. Electricity may be turned aside from its course, and so may the cannon-ball or running water; but remove every obstruction, and leave the current or the shot free to continue on in the direction of the first impulse, or to turn aside of its own volition, so to speak, and straight it will go, and continue to go—if on a plane, in a straight line; if on a sphere, in the arc of a great circle—thus showing that it has no volition except to obey impulse, and the physical requirements to take the shortest way to its point of destination.

The waters of the Gulf Stream, as they escape from the Gulf (§ 135), are bound over to the British Islands, to the North Sea, and Frozen Ocean (Plate XIX.). Accordingly, they take (§ 141), in obedience to this physical law, the most direct course by which nature will permit them to reach their destination

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And this course, as already remarked, is nearly that of the great circle, and exactly that of the supposed cannon ball.

Many philosophers have expressed the opinion—indeed, the belief is common among mariners (§ 140)—that the coasts of the United States and the Shoals of Nantucket turn the Gulf Stream toward the east; but if the view I have been endeavoring to make clear be correct—and I think it is—it appears that the course of the Gulf Stream is fixed and prescribed by exactly the same laws that require the planets to revolve in orbits, the planes of which shall pass through the centre of the sun; and that, were the Nantucket Shoals not in existence, the course of the Gulf Stream, in the main, would be exactly as it is, and where it is. The Gulf Stream is bound over to the North Sea and Bay of Biscay partly for the reason, perhaps, that the waters there are lighter than those of the Mexican Gulf (§ 135);* and if the Shoals of Nantucket were not in existence, it could not pursue a more direct route. The Grand Banks, however, are encroaching, and cold currents from the north come down upon it; they may, and probably do, assist now and then to turn it aside.

Now if this explanation as to the *course* of the Gulf Stream and its eastward tendency hold good, a current setting from the north toward the south should have a westward tendency. It should also move in a great circle, or rather in the circle of trajection, calling thus the circle traced upon the earth which would be described by a trajectile moving through the air without resistance and for a great distance. Accordingly, and in obedience to the propelling powers, derived from the rate at which different parallels are whirled around in diurnal motion, we find the current from the north, which meets the Gulf Stream on the Grand Banks (Plate XIX.), taking a south*westwardly* direction, as already described (§ 139). It runs down to the tropics by the side of the Gulf Stream, and stretches as far to the west as our own shores will allow. Yet, in the face of these facts, and in spite of this force, both Major Rennell and M. Arago make the coasts of the United States and the Shoals of Nantucket to turn the Gulf Stream toward the east.

143. But there are other forces operating upon the Gulf Stream. They are derived from the effect of changes in the waters of the whole ocean, as produced by changes in their temperature from time to time. As the Gulf Stream leaves the coasts of the United States, it begins to vary its position according to the seasons; the limit of its northern edge, as it passes the meridian of Cape Race (Plate XVII.), being in winter about latitude 40°–41°, and in September, when the sea is hottest, about latitude 45°–46°. The trough of the Gulf Stream, therefore, may be supposed to waver about in the ocean not unlike a pennon in the breeze. Its head is confined between the shoals of the Bahamas and the Carolinas, but that part of it which stretches over toward the Grand Banks of Newfoundland is, as the temperature of the waters of the ocean changes, first pressed down toward the south, and then again up toward the north, according to the season of the year.

To appreciate the extent of the force by which it is so pressed, let us imagine the waters of the Gulf

* The waters of the Atlantic generally contain 5½ per cent. more of saline matter than those of the English Channel.—*M. Bouillon la Grange.*

Stream to extend all the way to the bottom of the sea, so as completely to separate, by an impenetrable liquid wall, if you please, the waters of the ocean on the right from the waters in the ocean on the left of the stream. It is the height of summer: the waters of the sea on either hand are for the most part in a liquid state, and the Gulf Stream, let it be supposed, has assumed a normal condition between the two divisions, adjusting itself to the pressure on either side so as to balance them exactly and be in equilibrium. Now, again, it is the dead of winter, and the temperature of the waters over an area of millions of square miles in the North Atlantic has been changed many degrees, and this change of temperature has been followed by a change in the specific gravity of those waters, amounting, no doubt, in the aggregate, to many hundred millions of tons, over the whole ocean; for sea water, unlike fresh (§ 132), contracts to freezing. Now is it probable that, in passing from their summer to their winter temperature, the sea waters to the right of the Gulf Stream should change their specific gravity exactly as much in the aggregate as do the waters in the whole ocean to the left of it? If not, the difference must be compensated by some means. Sparks are not more prone to fly upward, nor water to seek its level, than Nature is sure, with her efforts, to restore equilibrium in both sea and air whenever, wherever, and by whatever it be disturbed. Therefore, though the waters of the Gulf Stream do not extend to the bottom, and though they be not impenetrable to the waters on either hand, yet, seeing that they have a waste of waters on the right and a waste of waters on the left, to which (§ 126) they offer a sort of resisting permeability, we are enabled to comprehend how the waters on either hand, as their specific gravity is increased or diminished, will impart to the trough of this stream a vibratory motion, pressing it now to the right, now to the left, according to the seasons and the consequent changes of temperature in the sea.

144. Plate XVII. shows the limits of the Gulf Stream for March and September. The reason for this change of position is obvious. The banks of the Gulf Stream are cold water. In winter, the volume of cold water on the American, or left side of the stream, is greatly increased. It must have room, and gains it by pressing the warmer waters of the stream further to the south, or right. In September, the temperature of these cold waters is modified; there is not such an extent of them, and then the warmer waters, in turn, press them back, and so the pendulum-like motion is preserved.

The observations made by the United States Coast Survey indicate that there are in the Gulf Stream threads of warmer, separated by streaks of cooler water. See Plate XVII., in which these are shown. Figure A may be taken to represent a thermometrical cross section of the stream opposite the Capes of Virginia, for instance; the top of the curve representing the thermometer in the threads of the warmer water, and the depressions the height of the same instrument in the streaks of cooler water between, thus exhibiting, as one sails from America across the Gulf Stream, a remarkable series of thermometrical elevations and depressions in the surface temperature of this mighty river in the sea.

145. As a rule, the hottest water of the Gulf Stream is at or near the surface; and as the deep sea thermometer is sent down, it shows that these waters, though still far warmer than the water on either side at corresponding depths, gradually become less and less warm until the bottom of the current is reached. There is reason to believe that the warm waters of the Gulf Stream are nowhere permitted, in the oceanic

economy, to touch the bottom of the sea. There is everywhere a cushion of cool water between them and the solid parts of the earth's crust. This arrangement is suggestive, and strikingly beautiful. One of the benign offices of the Gulf Stream is to convey heat from the Gulf of Mexico, where otherwise it would become excessive, and to disperse it in regions beyond the Atlantic for the amelioration of the climates of the British Islands and of all Western Europe. Now cold water is one of the best non-conductors of heat, and if the warm water of the Gulf Stream was sent across the Atlantic in contact with the solid crust of the earth—comparatively a good conductor of heat—instead of being sent across, as it is, in contact with a cold, non-conducting cushion of cool water to fend it from the bottom, all its heat would be lost in the first part of the way, and the soft climates of both France and England would be as that of Labrador, severe in the extreme, and ice-bound.

146. But to return to the streaks and reservoirs of hot water below. The hottest water is the lightest; as it rises to the top, it is cooled both by evaporation and exposure, when the surface is replenished by fresh supplies of hot water from below. Thus, in a winter's day, the waters at the surface of the Gulf Stream off Cape Hatteras may be at 80°, and at the depth of five hundred fathoms—three thousand feet—as actual observations show, the thermometer will stand at 57°. Following the stream thence off the Capes of Virginia, one hundred and twenty miles, it will be found—the water-thermometer having been carefully noted all the way—that it now stands a degree or two less at the surface, while all below is cooler. In other words, the stratum of water at 57°, which was three thousand feet below the surface off Hatteras, has, in a course of one hundred and twenty or one hundred and thirty miles in a horizontal direction, ascended, vertically, six hundred feet; that is, this stratum has run up hill with an ascent of five or six feet to the mile.

In the case of boiling springs, we perceive how all the ascending water comes up in one column; that there is no descent of surface water through that which is boiling up, but at the side of the bubbling. Moreover, in a cold winter's day, the water, as it boils up, is relatively warm; it smokes, grows cool, and the surface thermometer will stand highest where it is boiling, lowest off a little way toward the verge of the fountain. Just so with these warmer and cooler streaks in the Gulf Stream. This warm water, in its ascent of five feet to the mile—suppose we are considering the streak which is the hottest, and is, also, the nearest to the American shore—represents the boiling in the fountain; the warm, ascending water rising up in one body, and the cooler and heavier water going off to the side in another body, to sink and take its place with the other waters of the stream according to gravity and temperature. See the streaks *x*, *y*, *z*, Plate XVII.

Now, when these waters come to the top and cool, they are travelling with the current toward the north, and the effect of diurnal rotation is to turn them, as it turns any other drift (§ 139), to the eastward. They obey this influence to a certain extent, sinking down as they obey, in consequence of their greater specific gravity; beyond this sinking—*i. e.* further from the shore—is another rising-up place, each thread of the hot water being less and less warm, and each stream of cooler water more and more cool. The forces of diurnal rotation, operating upon the waters as they are successively sloughed off from each

thread and streak alternately above and below, are quite enough to determine them to the east. A rod being poised on a point at one end, so as to stand alone, has no more tendency to fall to the east than to the west; but the smallest force, the slightest breath will determine it either way. So with the forces of diurnal rotation, and these streaks of warm and cool water; the water that has been to the top and is cooled must give way to warmer water that is pressing up from below; it must flow either to the west or to the east, and diurnal rotation assists in determining it. When it sinks and reaches its proper level, it must again go to the east or to the west to get into the ascending column, and rise again to the surface in its proper turn. There is no more tendency for it to go to the west than to the east, and diurnal rotation like the weight of the feather is sufficient; it again plies its forces, and they are obeyed.

Taking all these facts and views into consideration, we are led to the conclusion with which we set out (§ 142), that it is the law of matter in motion, and not the Shoals of Nantucket, that controls the Gulf Stream in its course.

CHAPTER IX.

INFLUENCE OF THE GULF STREAM UPON CLIMATES.*

The Sea a Part of a Grand Machine, § 148.—*Influence of the Gulf Stream upon the Meteorology of the Sea*, 149.—Dampness of Climate of England due to it, 150.—The Pole of Maximum Cold, 151.—Gales of the Gulf Stream, 152.—*Influence of the Gulf Stream upon Commerce and Navigation*, 153.—Thermal Navigation, 154.

147. MODERN ingenuity has suggested a beautiful mode of warming houses in winter. It is done by means of hot water. The furnace and the caldron are sometimes placed at a distance from the apartments to be warmed. It is so at the Observatory. In this case, pipes are used to conduct the heated water from the caldron under the superintendent's dwelling over into one of the basement-rooms of the Observatory, a distance of one hundred feet. These pipes are then flared out so as to present a large cooling surface; after which they are united into one again, through which the water, being now cooled, returns of its own accord to the caldron. Thus cool water is returning all the time and flowing in at the bottom of the caldron, while hot water is continually flowing out at the top.

The ventilation of the Observatory is so arranged that the circulation of the atmosphere through it is led from this basement-room, where the pipes are, to all other parts of the building; and in the process of this circulation, the warmth conveyed by the water to the basement is taken thence by the air and distributed over all the rooms. Now, to compare small things with great, we have, in the warm waters which are confined in the Gulf of Mexico, just such a heating apparatus for Great Britain, the North Atlantic, and Western Europe.

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* *Vide* Maury's Physical Geography of the Sea.

The furnace is the torrid zone; the Mexican Gulf and Caribbean Sea are the caldrons; the Gulf Stream is the conducting pipe. From the Grand Banks of Newfoundland to the shores of Europe is the basement—the hot-air chamber—in which this pipe is flared out so as to present a large cooling surface. Here the circulation of the atmosphere is arranged by nature; and it is such that the warmth thus conveyed into this warm-air chamber of mid-ocean is taken up by the genial west winds, and dispensed, in the most benign manner, throughout Great Britain and the west of Europe.

The maximum temperature of the water-heated air-chamber of the Observatory is about 90°. The maximum temperature of the Gulf Stream is 86°, or about 9° above the ocean temperature due the latitude. Increasing its latitude 10°, it loses but 2° of temperature; and, after having run three thousand miles toward the north, it still preserves, even in winter, the heat of summer. With this temperature, it crosses the 40th degree of north latitude, and there, overflowing its liquid banks, it spreads itself out for thousands of square leagues over the cold waters around, and covers the ocean with a mantle of warmth that serves so much to mitigate in Europe the rigors of winter. Moving now more slowly, but dispensing its genial influences more freely, it finally meets the British Islands. By these it is divided (Plate XIX.), one part going into the polar basin of Spitzbergen, the other entering the Bay of Biscay, but each with a warmth considerably above the ocean temperature. Such an immense volume of heated water cannot fail to carry with it beyond the seas a mild and moist atmosphere. And this it is which so much softens climate there.

We know not, except approximately in one or two places, what the depth or the under temperature of the Gulf Stream may be; but *assuming* the temperature and velocity at the depth of two hundred fathoms to be those of the surface, and taking the well-known difference between the capacity of air and of water for specific heat as the argument, a simple calculation will show that the quantity of heat discharged over the Atlantic from the waters of the Gulf Stream in a winter's day would be sufficient to raise the whole column of atmosphere that rests upon France and the British Islands from the freezing point to summer heat.

Every west wind that blows crosses the stream on its way to Europe, and carries with it a portion of this heat to temper there the northern winds of winter. It is the influence of this stream upon climate that makes Erin the "Emerald Isle of the Sea," and that clothes the shores of Albion in evergreen robes; while in the same latitude, on this side, the coasts of Labrador are fast bound in fetters of ice. In a valuable paper on currents,* Mr. Redfield states that in 1831 the harbor of St. John's, Newfoundland, was closed with ice as late as the month of June; yet who ever heard of the port of Liverpool, on the other side, though 2° further north, being closed with ice, even in the dead of winter?

The Thermal Chart (Plate XX.) shows this. The isothermal lines of 60°, 50°, &c., starting off from the parallel of 40° near the coasts of the United States, run off in a northeastwardly direction, showing the same oceanic temperature on the European side of the Atlantic in latitude 55° or 60°, that we have on the western side in latitude 40°. Scott, in one of his beautiful novels, tells us that the ponds in the

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* American Journal of Science, vol. xiv. p. 293.

Orkneys (latitude near 60°) are not frozen in winter. The people there owe their soft climate to this grand heating apparatus, for drift-wood from the West Indies is occasionally cast ashore there by the Gulf Stream.

Nor do the beneficial influences of this stream upon climate end here. The West Indian Archipelago is encompassed on one side by its chain of islands, and on the other by the Cordilleras of the Andes contracting with the Isthmus of Darien, and stretching themselves out over the plains of Central America and Mexico. Beginning on the summit of this range, we leave the regions of perpetual snow, and descend first into the *tierra templada*, and then into the *tierra caliente*, or burning land. Descending still lower, we reach both the level and the surface of the Mexican seas, where, were it not for this beautiful and benign system of aqueous circulation, the peculiar features of the surrounding country assure us we should have the hottest, if not the most pestilential climate in the world. As the waters in these two caldrons become heated, they are borne off by the Gulf Stream, and are replaced by cooler currents through the Caribbean Sea; the surface water, as it enters here, being 3° or 4°, and that in depth 40°* cooler than when it escapes from the Gulf. Taking only this difference in surface temperature as an index of the heat accumulated there, a simple calculation will show that the quantity of specific heat daily carried off by the Gulf Stream from those regions, and discharged over the Atlantic, is sufficient to raise mountains of iron from zero to the melting point, and to keep in flow from them a molten stream of metal greater in volume than the waters daily discharged from the Mississippi River. Who, therefore, can calculate the benign influence of this wonderful current upon the climate of the south? In the pursuit of this subject, the mind is led from nature up to the Great Architect of nature; and what mind will the study of this subject not fill with profitable emotions? Unchanged and unchanging alone, of all created things, the ocean is the great emblem of its everlasting Creator. "He treadeth upon the waves of the sea," and is seen in the wonders of the deep. Yea, "He calleth for its waters, and poureth them out upon the face of the earth."

In obedience to this call, the aqueous portion of our planet preserves its beautiful system of circulation. By it heat and warmth are dispensed to the extra-tropical regions; clouds and rain are sent to refresh the dry land; and by it cooling streams are brought from polar seas to temper the heat of the torrid zone. At the depth of two hundred and forty fathoms, the temperature of the currents setting into the Caribbean Sea has been found as low as 48°, while that of the surface was 85°. Another cast with three hundred and eighty-six fathoms gave 43° below against 83° at the surface. The hurricanes of those regions agitate the sea to great depths; that of 1780 tore rocks up from the bottom in seven fathoms, and cast them on shore. They therefore cannot fail to bring to the surface portions of the cooler water below.

At the very bottom of the Gulf Stream, when its surface temperature was 80°, the deep sea thermometer of the Coast Survey has recorded temperatures as low as 38° Fahrenheit.

These cold waters doubtless come down from the north to replace the warm water sent through the Gulf Stream to moderate the cold of Spitzbergen; for, within the Arctic Circle, the temperature at corre-

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* **Temperature of the Caribbean Sea (from the journals of Mr. Dunsterville):—**

Surface temperature 83°, September; 84° July; 83°–86½° Mosquito Coast.

Temperature in depth, 48°, 240 fathoms; 43°, 386 fathoms; 42°, 450 fathoms; 43°, 500 fathoms.

sponding depths off the shores of that island is only one degree colder than in the Caribbean Sea, while on the coasts of Labrador the temperature in depth is said to be 25°, or 7° below the melting point of fresh water. Captain Scoresby relates that on the coast of Greenland, in latitude 72°, the temperature of the air was 42°; of the water, 34°; and 39° at the depth of one hundred and eighteen fathoms. He there found a current setting to the south, and bearing with it this extremely cold water, with vast numbers of icebergs, whose centres, perhaps, were far below zero. It would be curious to ascertain the routes of these under currents on their way to the tropical regions, which they are intended to cool. One has been found at the equator two hundred miles broad, and 23° colder than the surface water. Unless the land or shoals intervene, it no doubt comes down in a spiral curve, approaching the great circle.

Perhaps the best indication as to these cold currents may be derived from the fish of the sea. The whales first pointed out the existence of the Gulf Stream by avoiding its warm waters. Along our own coasts, all those delicate animals and marine productions which delight in warmer waters are wanting; thus indicating, by their absence, the cold current from the north now known to exist there. In the genial warmth of the sea about the Bermudas on one hand, and Africa on the other, we find, in great abundance, those delicate shell-fish and coral formations which are altogether wanting in the same latitudes along the shores of South Carolina. The same obtains in the west coast of South America; for there the cold current almost reaches the line before the first sprig of coral is found to grow.

A few years ago, great numbers of bonita and albercore—tropical fish—following the Gulf Stream, entered the English Channel, and alarmed the fishermen of Cornwall and Devonshire by the havoc which they created among the pilchards there.

It may well be questioned if our Atlantic cities and towns do not owe their excellent fish-markets, as well as our watering-places their refreshing sea-bathing in summer, to this stream of cold water. The temperature of the Mediterranean is 4° or 5° above the ocean temperature of the same latitude, and the fish there are very indifferent. On the other hand, the temperature along our coast is several degrees below that of the ocean, and from Maine to Florida our tables are supplied with the most excellent of fish. The sheepshead, so much esteemed in Virginia and the Carolinas, when taken on the warm coral banks of the Bahamas, loses its flavor, and is held in no esteem. The same is the case with other fish: when taken in the cold water of that coast, they have a delicious flavor and are highly esteemed; but when taken in the warm water on the other edge of the Gulf Stream, though but a few miles distant, their flesh is soft and unfit for the table. The temperature of the water at the Balize reaches 90°. The fish taken there are not to be compared with those of the same latitude in this cold stream. New Orleans, therefore, resorts to the cold waters on the Florida coasts for her choicest fish. The same is the case in the Pacific. A current of cold water from the south sweeps the shores of Chili, Peru, and Columbia, and reaches the Gallipagos Islands under the line. Throughout this whole distance, the world does not afford a more abundant or excellent supply of fish. Yet out in the Pacific, at the Society Islands, where coral abounds, and the water preserves a higher temperature, the fish, though they vie in gorgeousness of coloring with the birds, and plants, and insects of the tropics, are held in no esteem as an article of food. I have known sailors,

even after long voyages, still to prefer their salt beef and pork to a mess of fish taken there. The few facts which we have bearing upon this subject seem to suggest it as a point of the inquiry to be made, whether the habitat of certain fish does not indicate the temperature of the water; and whether these cold and warm currents of the ocean do not constitute the great highways through which migratory fishes travel from one region to another.

Navigators have often met with vast numbers of young sea-nettles (*medusæ*) drifting along with the Gulf Stream. They are known to constitute the principal food for the whale; but whither bound by this route has caused much curious speculation, for it is well known that the habits of the right whale are averse to the warm waters of this stream. An intelligent sea captain informs me that, two or three years ago, in the Gulf Stream on the coast of Florida, he fell in with such a "school of young sea-nettles as had never before been heard of." The sea was covered with them for many leagues. He likened them, in appearance on the water, to acorns floating on a stream; but they were so thick as to completely cover the sea. He was bound to England, and was five or six days in sailing through them. In about sixty days afterward, on his return, he fell in with the same school off the Western Islands, and here he was three or four days in passing them again. He recognized them as the same, for he had never before seen any like them; and on both occasions he frequently hauled up buckets full, and examined them.

Now the Western Islands is the great place of resort for whales; and at first there is something curious to us in the idea that the Gulf of Mexico is the harvest-field, and the Gulf Stream the gleaner which collects the fruitage planted there, and conveys it thousands of miles off to the hungry whale at sea. But how perfectly in unison is it with the kind and providential care of that great and good Being which feeds the young ravens when they cry, and caters for the sparrow!

The sea has its climates as well as the land. They both change with the latitude; but one varies with the elevation above, the other with the depression below the sea level. Each is regulated by circulation; but the regulators are, on the one hand, winds; on the other, currents.

148. The inhabitants of the ocean are as much the creatures of climate as are those of the dry land; for the same Almighty hand which decked the lily and cares for the sparrow fashioned also the pearl and feeds the great whale. Whether of the land or the sea, they are all his creatures, subjects of his laws, and agents in his economy. The sea, therefore, we infer, has its offices and duties to perform; so, may we infer, have its currents, and so, too, its inhabitants; consequently, he who undertakes to study its phenomena must cease to regard it as a waste of waters. He must look upon it as a part of the exquisite machinery by which the harmonies of nature are preserved, and then he will begin to perceive the developments of order and the evidences of design which make it a most beautiful and interesting subject for contemplation.

To one who has never studied the mechanism of a watch, its main-spring or the balance-wheel is a mere piece of metal. He may have looked at the face of the watch, and, while he admires the motion of its hands, and the time it keeps, or the tune it plays, he may have wondered in idle amazement as to the character of the machinery which is concealed within. Take it to pieces, and show him each part

separately; he will recognize neither design, nor adaptation, nor relation between them; but put them together, set them to work, point out the offices of each spring, wheel, and cog, explain their movements, and then show him the result; now he perceives that it is all *one* design; that, notwithstanding the number of parts, their diverse forms and various offices, and the agents concerned, the whole piece is of *one* thought, the expression of *one* idea. He now perceives that when the main-spring was fashioned and tempered, its relation to all the other parts must have been considered; that the cogs on this wheel are cut and regulated—*adapted*—to the rachets on that, &c.; and his conclusion will be, that such a piece of mechanism could not have been produced by chance; the adaptation of the parts is such as to be according to design, and obedient to the will of *one* intelligence. So, too, when one looks out upon the face of this beautiful world, he may admire the lovely scene, but his admiration can never grow into adoration unless he will take the trouble to look behind and study, in some of its details at least, the exquisite system of machinery by which such beautiful results are accomplished. To him who does this, the sea, with its physical geography becomes as the main-spring of a watch; its waters, and its currents, and its salts, and its inhabitants, with their adaptations, as balance-wheels, cogs and pinions, and jewels. Thus he perceives that they, too, are according to design; that they are the expression of One Thought, a unity with harmonies which One Intelligence, and One Intelligence alone, could utter. And when he has arrived at this point, he feels that the study of the sea, in its physical aspect, is truly sublime. It elevates the mind and ennobles the man. The Gulf Stream is now no longer, therefore, to be regarded by such an one merely as an immense current of warm water running across the ocean, but as a balance-wheel; a part of that grand machinery by which air and water are adapted to each other, and by which this earth itself is adapted to the well-being of its inhabitants—of the flora which deck, and the fauna which enliven its surface.

149. Let us therefore consider the influence of the Gulf Stream upon the meteorology of the ocean.

To use a sailor expression, the Gulf Stream is the great "weather breeder" of the North Atlantic Ocean. The most furious gales of wind sweep along with it; and the fogs of Newfoundland, which so much endanger navigation in winter, doubtless owe their existence to the presence, in that cold sea, of immense volumes of warm water brought by the Gulf Stream. Sir Philip Brooke found the air on each side of it at the freezing point, while that of its waters was 80°. "The heavy, warm, damp air over the current produced great irregularities in his chronometers." The excess of heat daily brought into such a region by the waters of the Gulf Stream would, if suddenly stricken from them, be sufficient to make the column of superincumbent atmosphere hotter than melted iron.

With such an element of atmospherical disturbance in its bosom, we might expect storms of the most violent kind to accompany it in its course. Accordingly, the most terrific that rage on the ocean have been known to spend their fury in and near its borders.

Our nautical works tell us of a storm which forced this stream back to its sources, and piled up the water in the Gulf to the height of thirty feet. The Ledbury Snow attempted to ride it out. When it abated, she found herself high upon the dry land, and discovered that she had let go her anchor among

the tree tops on Elliott's Key. The Florida Keys were inundated many feet, and, it is said, the scene presented in the Gulf Stream was never surpassed in awful sublimity on the ocean. The water thus dammed up is said to have rushed out with wonderful velocity against the fury of the gale, producing a sea that beggared description.

The "great hurricane" of 1780 commenced at Barbadoes. In it, the bark was blown from the trees, and the fruits of the earth destroyed; the very bottom and depths of the sea were uprooted, and the waves rose to such a height that forts and castles were washed away, and their great guns carried about in the air; houses were blown down, ships were wrecked, and the bodies of men and beasts lifted up above the earth and dashed to pieces in the storm. At the different islands, not less than twenty thousand persons lost their lives on shore, while further to the north, the Sterling Castle and the Dover Castle, men-of-war, were wrecked at sea, and fifty sail driven on shore at the Bermudas.

Several years ago, the British Admiralty set on foot inquiries as to the cause of the storms in certain parts of the Atlantic, which so often rage with disastrous effects to navigation. The result may be summed up in the conclusion to which the investigation led: that they are occasioned by the irregularity between the temperature of the Gulf Stream and of the neighboring regions, both in the air and water.

150. The habitual dampness of the climate of the British Islands, as well as the occasional dampness of that along the Atlantic coasts of the United States when easterly winds prevail, is attributable also to the Gulf Stream. They come to us loaded with vapors gathered from its warm and smoking waters.

It carries the temperature of summer, even in the dead of winter, as far north as the Grand Banks of Newfoundland.

151. One of the poles of maximum cold is, according to theory, situated in latitude 80° north, longitude 100° west. It is distant but little more than two thousand miles, in a northwestwardly direction, from the summer-heated waters of this stream. This proximity of extremes of greatest cold and summer heat, will, as observations are multiplied and discussed, be probably found to have much to do with the storms that rage with such fury on the left side of the Gulf Stream.

152. I am not prepared to maintain that the Gulf Stream is really the "Storm King" of the Atlantic, which has power to control the march of every gale that is raised there; but the course of many gales has been traced from the place of their origin directly to the Gulf Stream. Gales that take their rise on the coast of Africa, and even as far down on that side as the parallel of 10° or 15° north latitude, have, it has been shown by an examination of log-books, made straight for the Gulf Stream; joining it, they have then been known to turn about, and, travelling with this stream, to recross the Atlantic, and so reach the shores of Europe. In this way, the tracks of storms have been traced out and followed for a week or ten days. Their path is marked by wreck and disaster. At the meeting of the American Association for the advancement of Science in 1854, Mr. Redfield mentioned one which he had traced out, and in which no less than seventy odd vessels had been wrecked, dismasted, or damaged.

Plate X. was prepared by Lieutenant B. S. Porter, from data furnished by the log-books at the Observatory. It represents one of these storms that commenced in August, 1848. It commenced more

than a thousand miles from the Gulf Stream, made a straight course for it, and travelled with it for many days.

The dark shading shows the space covered by the gale, and the white line in the middle shows the axis of the gale, or the line of minimum barometric pressure. There are many other instances of similar gales.

Now what should attract these terrific storms to the Gulf Stream? Sailors dread storms in the Gulf Stream more than they do in any other part of the ocean. It is not the fury of the storm alone that they dread, but it is the "ugly sea" which these storms raise. The current of the stream running in one direction, and the wind blowing in another, creates a sea that is often frightful.

In the month of December, 1853, the fine new steamship San Francisco sailed from New York with a regiment of United States troops on board, bound around Cape Horn for California. She was overtaken, while crossing the Gulf Stream, by a gale of wind, in which she was terribly crippled. Her decks were swept, and by one single blow of those terrible seas that the storms there raise, one hundred and seventy-nine souls, officers and soldiers, were washed overboard and drowned.

The day after this disaster she was seen by one vessel, and again the next day, December 26th, by another; but neither of them could render her any assistance.

When they arrived in the United States and reported what they had seen, the most painful apprehensions were entertained, by friends, for the safety of those on board. Vessels were sent out to search for and relieve her. But which way should these vessels go? Where should they look?

An appeal was made to know what light the system of researches carried on at the National Observatory concerning winds and currents could throw upon the subject.

The materials that had been discussed were examined, and a chart was prepared to show the course of the Gulf Stream at that season of the year. (See the limits of the Gulf Stream for March, Plate XVII.) Upon the supposition that the steamer had been completely disabled, the lines *a b* were drawn to define the limits of her drift. Between these two lines, it was said, the steamer, if she could neither steam nor sail after the gale, had drifted.

By request, I prepared instructions for two revenue cutters that were sent to search for her. One of them, being at New London, was told to go along the dotted track leading to *c*, expecting thereby to keep inside of the line along which the steamer had drifted, with the view of intercepting and speaking homeward-bound vessels that might have seen the wreck.

The cutter was to proceed to *c*, where she might expect to fall in with the line of drift taken by the steamer. The last that was seen of that ill-fated vessel was when she was at *o*. So, if the cutter had been in time, she had instructions that would have taken her in sight of the object of her search.

It is true that, before the cutter sailed, the Kilby, the Three Bells, and the Antarctic, unknown to anxious friends at home, had fallen in with and relieved the wreck; but that does not detract from the system of observations, of the results of which, and their practical application, it is the object of this work to treat.

A beautiful illustration of their usefulness is the fact that, though the barque Kilby lost sight of the wreck at night, and the next morning did not know which way to look for it, and could not find it, yet, by a system of philosophical deduction, we on shore could point out the whereabouts of the disabled steamer so closely, that vessels could be directed to look for her exactly where she was to be seen.

These storms, for which the Gulf Stream has such attraction, and over which it seems to exercise so much control, are said to be, for the most part, whirlwinds. All boys are familiar with miniature whirlwinds on shore. They are seen, especially in the autumn, sweeping along the roads and streets, raising columns of dust, leaves, &c., which rise up like inverted cones in the air, and gyrate about the centre or axis of the storm. Thus, while the axis, and the dust, and the leaves, and all those things which mark the course of the whirlwind, are travelling in one direction, it may be seen that the wind is blowing around this axis in all directions.

Just so with some of these Gulf Stream storms. That represented on Plate X. is such a one. It was a rotary storm. Mr. Piddington, an eminent meteorologist of Calcutta, calls them *Cycloins*.

Now, what should make these storms travel toward the Gulf Stream, and then, joining it, travel along with its current? It is the high temperature of its waters, say mariners. But why, or wherefore, should the spirits of the storm obey in this manner the influence of these high temperatures, philosophers have not been able to explain.

153. *The influence of the Gulf Stream upon commerce and navigation.*

Formerly, the Gulf Stream controlled commerce across the Atlantic by governing vessels in their routes through this ocean to a greater extent than it does now, and simply for the reason that ships are faster, instruments better, and navigators are more skilful now than formerly they were.

Up to the close of the last century, the navigator *guessed* as much as he *calculated* the place of his ship: vessels from Europe to Boston frequently made New York, and thought the land-fall by no means bad. Chronometers, now so accurate, were then an experiment. The Nautical Ephemeris itself was faulty, and gave tables which involved errors of thirty miles in the longitude. The instruments of navigation erred by *degrees* quite as much as they now do by *minutes;* for the rude "cross staff" and "back staff," the "sea-ring" and "mariner's bow," had not yet given place to the nicer sextant and circle of reflection of the present day. Instances are numerous of vessels navigating the Atlantic in those times being 6°, 8°, and even 10° of longitude out of their reckoning in as many days from port.

Though navigators had been in the habit of crossing and recrossing the Gulf Stream almost daily for three centuries, it never occurred to them to make use of it as a means of giving them their longitude, and of warning them of their approach to the shores of this continent.

Dr. Franklin was the first to suggest this use of it. The contrast afforded by the temperature of its waters and that of the sea between the Stream and the shores of America was striking. The dividing line between the warm and the cool waters was sharp (§ 126); and this dividing line, especially that on the western side of the stream, never changed its position as much in longitude as mariners erred in their reckoning.

When he was in London, in 1770, he happened to be consulted as to a memorial which the Board of Customs at Boston sent to the Lords of the Treasury, stating that the Falmouth packets were generally a fortnight longer to Boston than common traders were from London to Providence, Rhode Island. They therefore asked that the Falmouth packets might be sent to Providence instead of to Boston. This appeared strange to the doctor, for London was much further than Falmouth, and from Falmouth the routes were the same, and the difference should have been the other way. He, however, consulted Captain Folger, a Nantucket whaler, who chanced to be in London also; the fisherman explained to him that the difference arose from the circumstance that the Rhode Island captains were acquainted with the Gulf Stream, while those of the English packets were not. The latter kept in it, and were set back sixty or seventy miles a day, while the former avoided it altogether. He had been made acquainted with it by the whales which were found on either side of it, but never in it. At the request of the doctor, he then traced on a chart the course of this stream from the Straits of Florida. The doctor had it engraved at Tower Hill, and sent copies of it to the Falmouth captains, who paid no attention to it. The course of the Gulf Stream, as laid down by that fisherman from his general recollection of it, has been retained and quoted on the charts for navigation, we may say, until the present day.

But the investigations of which we are treating are beginning to throw more light upon this subject; they are giving us more correct knowledge in every respect with regard to it, and to many other new and striking features in the physical geography of the sea.

No part of the world affords a more difficult or dangerous navigation than the approaches of our northern coast in winter. Before the warmth of the Gulf Stream was known, a voyage at this season from Europe to New England, New York, and even to the Capes of the Delaware or Chesapeake, was many times more trying, difficult, and dangerous than it now is. In making this part of the coast, vessels are frequently met by snow-storms and gales which mock the seaman's strength and set at naught his skill. In a little while his barque becomes a mass of ice; with her crew frosted and helpless, she remains obedient only to her helm, and is kept away for the Gulf Stream. After a few hours' run, she reaches its edge, and almost at the next bound passes from the midst of winter into a sea at summer heat. Now the ice disappears from her apparel; the sailor bathes his stiffened limbs in tepid waters; feeling himself invigorated and refreshed with the genial warmth about him, he realizes, out there at sea, the fable of Antæus and his mother Earth. He rises up and attempts to make his port again, and is again as rudely met and beat back from the northwest; but each time that he is driven off from the contest, he comes forth from this stream, like the ancient son of Neptune, stronger and stronger, until, after many days, his freshened strength prevails, and he at last triumphs and enters his haven in safety—though in this contest he sometimes falls to rise no more, for it is often terrible. Many ships annually founder in these gales; and I might name instances, for they are not uncommon, in which vessels bound to Norfolk or Baltimore, with their crews enervated in tropical climates, have encountered, as far down as the Capes of Virginia, snow-storms that have driven them back into the Gulf Stream time and again, and have kept them out for forty, fifty, and even for sixty days, trying to make an anchorage.

Nevertheless, the presence of the warm waters of the Gulf Stream, with their summer heat in mid-

winter, off the shores of New England, is a great boon to navigation. At this season of the year especially, the number of wrecks and the loss of life along the Atlantic sea-front are frightful. The month's average of wrecks has been as high as three a day. How many escape by seeking refuge from the cold in the warm waters of the Gulf Stream is matter of conjecture. Suffice it to say, that before their temperature was known, vessels thus distressed knew of no place of refuge short of the West Indies; and the newspapers of that day—Franklin's *Pennsylvania Gazette* among them—inform us that it was no uncommon occurrence for vessels, bound for the Capes of the Delaware in winter, to be blown off and to go to the West Indies, and there wait for the return of spring before they would attempt another approach to this part of the coast.

154. Accordingly, Dr. Franklin's discovery with regard to the Gulf Stream temperature was looked upon as one of great importance, not only on account of its affording to the frosted mariner in winter a convenient refuge from the snow-storm, but because of its serving the navigator with an excellent landmark or beacon for our coast, in all weathers. And so viewing it, the doctor concealed his discovery, for we were then at war with England. It was then not uncommon for vessels to be as much as 10° out in their reckoning. He himself was 5°. Therefore, in approaching the coast, the current of warm water in the Gulf Stream, and of cold water on this side of it, if tried with the thermometer, would enable the mariner to judge with great certainty, and in the worst of weather, as to his position. Jonathan Williams afterward, in speaking of the importance which the discovery of these warm and cold currents would prove to navigation, pertinently asked the question, "If these stripes of water had been distinguished by the colors of red, white, and blue, could they be more distinctly discovered than they are by the constant use of the thermometer?" And he might have added, could they have marked the position of the ship more clearly?

When his work on *Thermometrical Navigation* appeared, Commodore Truxton wrote to him: "Your publication will be of use to navigation, by rendering sea voyages secure far beyond what even you yourself will immediately calculate, for I have proved the utility of the thermometer very often since we sailed together.

"It will be found a most valuable instrument in the hands of mariners, and particularly as to those who are unacquainted with astronomical observations; . . . . . these particularly stand in need of a simple method of ascertaining their approach to or distance from the coast, especially in the winter season; for it is then that passages are often prolonged, and ships blown off the coast by hard westerly winds, and vessels get into the Gulf Stream without its being known; on which account they are often hove to by the captains' supposing themselves near the coast when they are very far off (having been drifted by the currents). On the other hand, ships are often cast on the coast by sailing in the eddy of the Stream, which causes them to outrun their common reckoning. Every year produces new proofs of these facts, and of the calamities incident thereto."

Though Dr. Franklin's discovery was made in 1775, yet, for political reasons, it was not generally made known till 1790. Its immediate effect in navigation was to make the ports of the North as accessible in winter as in summer. What agency this circumstance had in the decline of the direct trade of the South,

which followed this discovery, would be, at least to the political economist, a subject for much curious and interesting speculation. I have referred to the commercial tables of the time, and have compared the trade of Charleston with that of the northern cities for several years, both before and after the discovery of Dr. Franklin became generally known to navigators. The comparison shows an immediate decline in the Southern trade, and a wonderful increase in that of the North. But whether this discovery in navigation and this revolution in trade stand in the relation of cause and effect, or be merely a coincidence, let others judge.

In 1769, the commerce of the two Carolinas equalled that of all the New England States together; it was more than double that of New York, and exceeded that of Pennsylvania by one third.* In 1792, the exports from New York amounted in value to two millions and a half; from Pennsylvania, to $3,820,000; and from Charleston alone, to $3,834,000.

But in 1795—by which time the Gulf Stream began to be as well understood by navigators as it now is, and the average passages from Europe to the North were shortened nearly one-half, while those to the South remained about the same—the customs at Philadelphia alone amounted to $2,941,000,† or more than one half of those collected in all the States together.

* *From M'Pherson's Annals of Commerce—Exports and Imports in* 1769, *valued in Sterling Money.*

EXPORTS.

	To Great Britain.			South of Europe.			West Indies.			Africa.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
New England	142,775	12	9	81,173	16	2	308,427	9	6	17,713	0	9	550,089	19	2
New York	113,382	8	8	50,885	13	0	66,324	17	5	1,313	2	6	231,906	1	7
Pennsylvania	28,112	6	9	203,762	11	11	178,331	7	8	560	9	9	410,756	16	1
North and South Carolina	405,014	13	1	76,119	12	10	87,758	19	3	691	12	1	569,584	17	3

IMPORTS.

	From Great Britain.			South of Europe.			West Indies.			Africa.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
New England	223,695	11	6	25,408	17	9	314,749	14	5	180	0	0	564,034	8	8
New York	75,930	19	7	14,927	7	8	97,420	4	0	697	10	0	188,976	1	3
Pennsylvania	204,979	17	4	14,249	8	4	180,591	12	4				399,830	18	0
North and South Carolina	327,084	8	6	7,099	5	10	76,269	17	11	137,620	10	0	535,714	2	3

† *Value of Exports in Dollars.*(*a*)

	1791.	1792.	1793.	1794.	1795.	1796.
Massachusetts	2,519,651	2,888,104	3,755,347	5,292,441	7,117,907	9,949,345
New York	2,505,465	2,535,790	2,932,370	5,442,000	10,304,000	12,208,027
Pennsylvania	3,436,000	3,820,000	6,958,000	6,643,000	11,518,000	17,513,866
South Carolina	2,693,000	2,428,000	3,191,000	3,868,000	5,988,000	7,620,000

Duties on Imports in Dollars.

	1791.	1792.	1793.	1794.	1795.	1796.	1833.
Massachusetts	1,006,000	723,000	1,044,000	1,121,000	1,520,000	1,460,000	3,055,000
New York	1,334,000	1,173,000	1,204,000	1,878,000	2,028,000	2,187,000	10,713,000
Pennsylvania	1,466,000	1,100,000	1,823,000	1,498,000	2,300,000	2,050,000	2,207,000
South Carolina	523,000	359,000	360,000	661,000	722,000	66,000	389,000

(*a*) Doc. No. 330, H. R., 2d Session, 25th Congress. Some of its statements do not agree with those taken from M'Pherson, and previously quoted.

Nor did the effect of the doctor's discovery end here. Before it was made, the Gulf Stream was altogether insidious in its effects. By it, vessels were often drifted many miles out of their course without knowing it; and in bad and cloudy weather, when many days would intervene from one observation to another, the set of the current, though really felt for but a few hours during the interval, could only be proportioned out equally among the whole number of days. Therefore navigators could have only very vague ideas either as to the strength or the actual limits of the Gulf Stream, until they were marked out to the Nantucket fishermen by the whales, or made known by Captain Folger to Dr. Franklin. The discovery, therefore, of its high temperature, assured the navigator of the presence of a current of surprising velocity, and which, now turned to certain account, would hasten, as it had retarded, his voyage in a wonderful degree.

Such, at the present day, is the degree of perfection to which nautical tables and instruments have been brought, that the navigator may now detect, and with great certainty, every current that thwarts his way. He makes great use of them. Colonel Sabine, in his passage, a few years ago, from Sierra Leone to New York, was drifted one thousand six hundred miles of his way by the force of currents alone; and, since the application of the thermometer to the Gulf Stream, the average passage from England has been reduced from upward of eight weeks to a little more than four.

Some political economists of America have ascribed the great decline of southern commerce, which followed the adoption of the Constitution of the United States, to the protection given by legislation to northern interests. But I think these statements and figures show that this decline was in no small degree owing to the Gulf Stream and the water thermometer; for they changed the relations of Charleston—the great southern emporium of the times—removing it from its position as a half-way house, and placing it in the category of an outside station.

CHAPTER X.

THE DEPTHS OF THE OCEAN.*

The Depth of Blue Water unknown, § 155.—Results of former Methods of Deep-sea Soundings not entitled to Confidence, 156.—The deepest Soundings reported, 157.—Plan adopted in the Navy, 158.—Why the Sounding-twine will not stop running out when the Plummet reaches Bottom, 159.—Indications of Under Currents, 160.—Soundings to be made from a Boat, 161.—Brooke's Deep-sea Sounding Apparatus, 162.—Rate of Descent, 163.—The greatest Depths at which Bottom has been found, 164.

155. UNTIL the commencement of the plan of deep-sea soundings, as now conducted in the American Navy, the bottom of what the sailors call "blue water" was as unknown to us as is the interior of any of the planets of our system. Ross and Dupetit Thouars, with other officers of the English, French, and

* *Vide* Maury's Physical Geography of the Sea. Harper and Brothers, New York.

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Dutch navies, had attempted to fathom the deep sea, some with silk threads, some with spun-yarn, and some with the common lead and line. All of these attempts were made upon the supposition that when the lead reached the bottom, either a shock would be felt, or the line, becoming slack, would cease to run out.

156. The series of systematic experiments recently made upon this subject shows that there is no reliance to be placed on such a supposition, for the shock caused by striking bottom cannot be communicated through very great depths, and therefore it does not follow that the line will become slack and cease to run out when the plummet reaches the bottom. Furthermore, the lights of experience show that, as a general rule, the under currents of the deep sea have force enough to take the line out long after the plummet has ceased to do so. Consequently, there is but little reliance to be placed upon deep-sea soundings of former methods, when the depths reported exceeded eight or ten thousand feet.

Attempts to fathom the ocean, both by sound and pressure, had been made, but in "blue water" every trial was only a failure repeated. The most ingenious and beautiful contrivances for deep-sea soundings were resorted to. By exploding heavy charges of powder in the deep sea, when the winds were hushed and all was still, the echo or reverberation from the bottom might, it was held, be heard, and the depth determined from the rate at which sound travels through water. But, though the explosion took place many feet below the surface, echo was silent, and no answer was received from the bottom. Ericsson and others constructed deep-sea leads having a column of air in them, which, by compression, would show the aqueous pressure to which they might be subjected. This was found to answer well for ordinary purposes, but in the depths of "blue water," where the pressure would be equal to several hundred atmospheres, the trial was more than this instrument could stand.

Mr. Baur, an ingenious mechanician of New York, constructed, according to a plan which I furnished him, a deep-sea sounding apparatus. To the lead was attached, upon the principle of the screw propeller, a small piece of clock-work, for registering the number of revolutions made by the little screw during the descent; and, it having been ascertained by experiment in shoal water that the apparatus, in descending, would cause the propeller to make one revolution for every fathom of perpendicular descent, hands provided with the power of self-registration were attached to a dial, and the instrument was complete. It worked beautifully in moderate depths, but failed in blue water, from the difficulty of hauling it up if the line used were small, and from the difficulty of getting it down if the line used were large enough to give the requisite strength for hauling up.

But, notwithstanding these failures, there was encouragement, for greater difficulties had been overcome in other departments of physical research. Astronomers had measured the volumes and weighed the masses of the most distant planets, and increased thereby the stock of human knowledge. Was it creditable to the age that the depths of the sea should remain in the category of an unsolved problem? Beneath its surface, was a sealed volume, abounding in knowledge and instruction that might be both useful and profitable to man. The seal which covered it was of rolling waves many thousand feet in thickness. Could it not be broken? Curiosity had always been great, still, neither the enterprise nor the ingenuity of man had as yet proved itself equal to the task. No one had succeeded in penetrating, and bringing up from beyond

the depth of two or three hundred fathoms below the aqueous covering of the earth, any specimens of solid matter for the study of philosophers.

The sea, with its myths, has suggested attractive themes to all people in all ages. Like the heavens, it affords an almost endless variety of subjects for pleasing and profitable contemplation, and there has remained in the human mind a longing to learn more of its wonders and to understand its mysteries. The Bible often alludes to them. Are they past finding out? How deep is it? and what is at the bottom of it? Could not the ingenuity and appliances of the age throw some light upon these questions?

The government was liberal and enlightened; times seemed propitious; but when or how to begin, after all these failures, with this interesting problem, was one of the difficulties first to be overcome.

It was a common opinion, derived chiefly from a supposed physical relation, that the depths of the sea are about equal to the heights of the mountains. But this conjecture was, at best, only a speculation. Though plausible, it did not satisfy. There were, in the depths of the sea, untold wonders and inexplicable mysteries. Therefore the contemplative mariner, as in mid-ocean he looked down upon the gentle bosom of the sea, continued to experience sentiments akin to those which fill the mind of the devout astronomer when, in the stillness of the night, he looks out upon the stars, and wonders.

Nevertheless, the depths of the sea still remained as fathomless and as mysterious as the firmament above. Indeed, telescopes of huge proportions and of vast space-penetrating powers had been erected here and there by the munificence of individuals, and attempts made with them to gauge the heavens and sound out the regions of space. Could it be more difficult to sound out the sea than to gauge the blue ether and fathom the vaults of the sky? The result of the astronomical undertakings* lies in the discovery that what, through other instruments of less power, appeared as clusters of stars, were, by these of larger powers, separated into groups, and what had been reported as nebulæ, could now be resolved into clusters; that, in certain directions, the abyss beyond these faint objects is decked with other nebulæ, which these great instruments may bring to light, but cannot resolve; and that there are still regions and realms beyond, which the rays of the brightest sun in the sky have neither the intensity nor the force to reach, much less to penetrate.

So, too, with the bottom of the sea, and the knowledge-seeking mariner. Though nothing thence had been brought to the light, exploration had invested the subject with additional interest, and increased the desire to know more. In this state of the case, the idea of a common twine thread for a sounding-line, and a cannon ball for a sinker, was suggested. It was a beautiful conception; for, besides its simplicity, it had in its favor the greatest of recommendations: it could be readily put into practice.

Well-directed attempts to fathom the ocean began now to be made, and the public mind was astonished at the vast depths that were at first reported.

157. Lieutenant Walsh, of the United States schooner Taney, reported a cast with the deep-sea lead at thirty-four thousand feet without bottom. His sounding-line was an iron wire more than eleven

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* See the works of Herschel and Ross, and their telescopes.

miles in length. Lieutenant Berryman, of the United States brig Dolphin, reported another unsuccessful attempt to fathom mid-ocean with a line thirty-nine thousand feet in length. Captain Denham, of her Britannic majesty's ship Herald, reported bottom in the South Atlantic at the depth of forty-six thousand feet; and Lieutenant J. P. Parker, of the United States frigate Congress, afterward, in attempting to sound near the same region, let go his plummet, and saw a line fifty thousand feet long run out after it as though the bottom had not been reached.

The three last-named attempts were made with the sounding-twine of the American Navy, which has been introduced in conformity with a very simple plan for sounding out the depths of the ocean. It involved for each cast only the expenditure of a cannon ball, and twine enough to reach the bottom. This plan was introduced as a part of the researches conducted at the National Observatory, and which have proved so fruitful and beneficial, concerning the winds and currents, and other phenomena of the ocean. These researches had already received the approbation of the Congress of the United States; for that body, in a spirit worthy of the representatives of a free and enlightened people, had authorized the Secretary of the Navy to employ three public vessels to assist in perfecting the discoveries, and in conducting the investigations connected therewith.

The following circular order to the commanders of all vessels of the navy has been issued, and is now in force.

Circular.

BUREAU OF ORDNANCE AND HYDROGRAPHY, *Nov.* 22, 1851.

158. SIR: Your attention is particularly invited to the accompanying Directions relative to deep-sea soundings.

You will take care that they be diligently and faithfully carried out on board the vessel under your command.

You will report, from time to time, to this Bureau, the latitude, longitude, depth, drift, time, and all the circumstances connected with each cast, whether successful in reaching bottom or not—stating the kind of sinker used, its weight, and whether the large or small twine was used.

This order is to supersede that of June 1, 1850, on the same subject, and the Directions given at pages 70 and 71 of Maury's 3d edition of *Sailing Directions*, so far as they may conflict with these.

Respectfully, your obedient servant,

C. MORRIS,

Chief of Bureau.

APPROVED: WILL. A. GRAHAM,

Secretary of the Navy.

To ———

Instructions for using the Sounding-Twine.

The twine for deep-sea soundings is of two sizes; the smaller size is intended to be used when no attempt is made to bring up specimens from the bottom. It is calculated to bear 60 pounds' weight in the air; it is about seven-hundredths of an inch in diameter, and measures 180 fathoms to the pound. It is marked at every 100 fathoms, and furnished on reels containing 10,000 fathoms each.

The larger size is to be used for bringing up specimens. It is calculated to bear a weight in the air of 150 pounds; it is about one-tenth of an inch in diameter, and measures about 80 fathoms to the pound. It is furnished on reels of 5,000 fathoms each.

It is desired, as a general rule, to have one deep-sea sounding only for every space of five degrees square, on a chart which is constructed with its meridians and parallels drawn only for every five degrees of latitude and longitude respectively.

The spaces in which deep-sea soundings have been made in the North Atlantic Ocean are shown on Plate XIV. It is desirable to have the soundings on that Plate with a note of interrogation after them, verified.

Attempts should be made to bring up specimens of the bottom whenever practicable; for this purpose, the large twine should be bent on to Brooke's deep-sea sounding apparatus.

A small Stellwagen cup attached to the bolt of Brooke's lead, may be substituted with advantage for the arming.

After a little experience, the officer charged with making deep-sea soundings will, it is thought, acquire skill enough, especially when the sea is not more than 2,000 fathoms deep, to bring up specimens with Brooke's apparatus and the small twine.

When the small twine is used without a Brooke's apparatus, double it for the first 200 fathoms, and use two 32 lb. shot as the sinker; when the shot reaches the bottom, the boat may ride by it, until the surface current shall be determined, when the line should be hauled in until it parts.

The sounding should in all cases be taken from a boat, and not from the vessel. The boat with its oars can be kept over the line, whereas the vessel will drift.

For deep-sea temperatures, a self-registering metallic thermometer should be used, especially at great depths. When no metallic thermometer is on board, then a resort to a non-conducting cylinder for bringing up the water should be had.

Approved: C. MORRIS.

December 17, 1853.

Directions for taking Deep-sea Soundings.

The information acquired from experience upon the subject of deep-sea soundings, enables me to say that I now consider it as practicable to fathom the greatest depths of the ocean, whatever they may be, as it is to sound out one of our bays or harbors.

Lieut. Walsh's experiments in the Taney satisfied me that no reliance could be put upon results obtained by sounding at great depths with wire. His great sounding, therefore, was most valuable and important, for it led the way to the use of twine.

159. It was thought that, upon the new plan, the common wrapping thread or twine used in the shops would answer for deep soundings. For it was supposed that bottom might be reached always and at any depth, especially in calm weather, simply by fastening the end of twine from such a reel to a common 32 lb. shot, throwing the shot overboard, and then paying out the twine as fast as the shot would take it from the reel. When the shot reached bottom, it was supposed that the line would stop running out; and then, cutting the thread, and seeing how much was left on the reel, the depth would, it was thought, be ascertained.

This required the loss of the shot and the twine, but they were cheap; for it was supposed that a mere thread, which had strength to hold together, would be strong enough.

But the experiments of Lieut. Wm. Rogers Taylor, on board the Albany, Captain Platt (a full account of which is contained in the 5th edition of this work), proved these notions to be wrong. The casts for deep-sea soundings, made on board that vessel, showed that it required twine of considerable strength for the purpose.

160. The existence of a physical state of things which bears upon the question was also suggested by Taylor's experiments; and that is, the probable existence in all parts of the sea of one or more under currents. In other words, these deep-sea soundings appear to confirm what I have been endeavoring to maintain in the chapter on the "Saltness of the Sea," and elsewhere, viz: That the ocean has its system of circulation, so ordered that its waters, whether at the surface or in the depths below, are seldom or never at rest; that this circulation is all-pervading, and perpetual, and is as constant in the horizontal as it is in the vertical direction.

This system of circulation commenced on the third day of creation, with the "gathering together of the waters," which were "called seas," and doubtless will continue as long as sea water shall possess the properties of saltness and fluidity.

The confirmation which the experiments in sounding out the depths of the ocean seem to afford for this conjecture, is derived from the inference, in the first place, that I draw from the experiments which, in a few cases, have been made in sounding at the same place, first with one and then with two 32 pound shot as a sinker. The results as to depths have been accordant; but invariably the depth, as given by the *two* shots is a little less than by one. The two shots sink faster than the one, the bight of the line in the former case, therefore, is not exposed so long to the action of the under currents; consequently, it is not swept so far out of the perpendicular with the two as it is with but the one shot.

In the next place, a degree of confirmation as to the correctness of this conjecture is afforded by the fact that, though the shot may reach the bottom, the line has, in no instance, ceased for any considerable length of time to run out; and, moreover, that after the shot has landed, there is, at very great depths, such a force brought upon the line, if it be held, as always to part it.

Imagine a line two, or three, or four miles long, hanging perpendicularly in the ocean—that the plummet to which it is attached has reached the bottom—and that there be one or more under currents moving in opposite or different directions, and operating upon it. They would operate with what sailors call a "swigging force," and that too with a power which no line would be strong enough to withstand for any considerable length of time.

Thus the importance of strong twine was pointed out; and it was also discovered that, to know when the shot had reached the bottom, it was necessary to time the intervals which were occupied by given lengths of line in going out. The most convenient lengths for this purpose are lengths of 100 fathoms each; and as mark after mark, which denotes these 100 fathoms lengths, passes from the sounding-reel, the time per watch is as carefully noted, by the officer who makes the sounding, as it should be if he were taking sights for the chronometer.

The soundings by the Albany, and others, were made from on board ship. In the first place, it was rarely that an opportunity favorable enough for a good cast from on board ship occurred. Moreover, the complaint was almost universal throughout the service of bad twine. Attempts to sound from the vessel were so often frustrated by the parting of the line, that officers were very much deterred from the trial. These failures were disheartening.

Furthermore, when the ship was hove to for the purpose, as the Albany frequently was, there was not only the drift of the ship to be taken into account, but the question as to the result still remained to perplex. Had the bottom been reached? And if so, was there any certainty that the depth was what the experiments seemed to indicate? Certainty as to this was greatly impaired by inequalities in the times of running, caused by the change in the rate of motion of the vessel as she "came up and fell off."

Such was the amount of our experience upon the subject of deep-sea soundings when Lieutenant S. P. Lee was ordered to the command of the Dolphin.

With characteristic energy he set about making preparations for this new service. His first business was to give the twine, furnished for deep-sea soundings, a thorough examination. He carefully overhauled, tested, and tried several hundred thousand fathoms. Much of it he found so defective that it had to be rejected, and the vessel detained until better could be procured. It was well he did so; for although the line, with which he proceeded to sea, was better than that which was rejected, nevertheless, experience proved that much of it, though new, was not strong enough. Its average strength was not even then sufficient to bear a weight of fifty-five pounds, nor was it all quite of the same size, as it should have been.

161. When he got to sea, he determined not to sound from the vessel at all; but to use a boat for sounding, altogether.

A BOAT SHOULD ALWAYS BE USED.

At first, he encountered many unexpected difficulties; but with industry, his ingenuity, and perseverance, these, one after another, were overcome, until the way was made plain, and the operation stripped of a vast amount of the uncertainties which had impaired, to a greater or less extent, the value of all the results hitherto obtained.

In the first place, though the small twine, furnished for the deepest soundings, would, much of it, bear a weight of seventy or even eighty pounds, yet, when he came to attach to it a thirty-two pound shot, to throw the shot overboard, and let it take the line from the reel as fast as it would, he found the line would part.

He then resorted to the expedient of doubling and even of trebling the line for the first two or three hundred fathoms. Thus, the parting was prevented. He found, moreover, that the operation was greatly facilitated by watching the trending of the line from the bows of the boat; and, with one or two oars of a side, directing the men how to pull, in order to keep the line "up and down."

Accordingly, we find him, when he first put to sea, occupied for more than a month, availing himself of every opportunity for sounding during the interval, and making day after day unsuccessful attempts.

Finally, he succeeded in getting out seventeen hundred fathoms without parting. Bottom was reached at this depth.

Out of the first seventeen casts that were made, this was the only successful one.

He was now in the fair way to get at the secret. The plan is to double or triple the line for the first three hundred fathoms; and, instead of letting the shot take it as fast as it will, and so bring up occasionally with a violent jerk and parting—and this, as experience abundantly proves, is very liable to be the case, particularly at the first going off, when the shot is sinking rapidly—Lee also adopted the expedient of keeping a gentle strain on the line at first; and this was accomplished by allowing a little friction to be applied to the reel, so that it would not for the first three hundred fathoms give the line to the shot quite as fast as the shot wanted to take it.

An important part of the plan, also, was that of keeping the boat, by means of a couple or more of oars, perpendicularly over the shot. To be sure that he had reached bottom, he on several occasions repeated the trial, using in this case two instead of one thirty-two pound shot for a sinker. The result was the same agreement as to depth.

Success crowned his efforts so far, and he now began to have such confidence in his results—for the mark of each successive hundred fathoms, as it went out, was carefully timed—that, with his shot on the bottom at the depth of three or four miles, he would use it as an anchor, ride by it in his boat out there in mid-ocean, while the force and set of the surface current, out upon blue water in the open sea, were accurately determined. This was the first time that such a thing had been done.

Thus, the egg was made to stand upon its end; and the plan of deep-sea soundings finally adopted,

and now in practice, is this: Every vessel of the navy, when she is preparing for sea, is, if her commander, or, with his consent, any officer on board, will pledge himself to attend to the deep-sea soundings, furnished with a sufficient quantity of sounding-twine, carefully marked at every length of one hundred fathoms—six hundred feet—and wound on reels of ten thousand fathoms each. It is the duty of the commander to avail himself of every favorable opportunity to try the depth of the ocean, whenever he may find himself out upon "blue water." For this purpose, he is to use a cannon ball of thirty-two pounds as a plummet. Having one end of the twine attached to it, the cannon ball is to be thrown overboard from a boat, and suffered to take the twine from the reel as fast as it will; and the reel is made to turn easily.

When Lieutenant Berryman took charge of the brig, and went to sea, of course he availed himself of Lee's experience, and commenced where Lee had left off.

162. But there was still one thing wanting: positive evidence that the plummet had reached bottom; for, hitherto, the plan had not contemplated the bringing up of specimens of the bottom, inasmuch as the hauling up of the shot from such great depth was regarded as an impracticability.

In this stage of the matter, Passed Midshipman J. M. Brooke, a clever young officer, who was at the time doing duty at the Observatory, proposed to me a contrivance by which he thought the shot might be detached as soon as it touched the bottom, and specimens brought up in its stead.

I was in the habit of consulting him; he often assisted me with his reflections; and I referred him to Mr. Greble, the instrument-maker of the Observatory, that they two might give his idea shape, and construct a model of the machine. The result was Brooke's Deep-Sea Sounding Apparatus, as exhibited on Plates VII. and VIII. It is a simple and beautiful contrivance, which a mere inspection of the Plates seems sufficient to explain.

A is a 64 pound shot, cast with a hole through it. Berryman preferred one of 46 lbs.; but experience seems to favor a heavier one. A 64 pound shot is therefore recommended.

B is an iron rod, which the armorer on board of any man-of-war may make, whenever one happens to be lost in the sounding.

c is the cup for the arming, by which the soundings are brought up. When *c* is filled with tallow or soap, a wooden plug should be forced up into the arming. Then this plug, on being extracted, will leave a cup or mould within the arming, so that a more ample supply of soundings may be brought up.

D the slings, which are made of wire attached to a leathern or canvas disk *e*.

F represents the catches of twine, and *g* the swivel to prevent the untwisting of the line from turning the shot, or the turning of the shot either from twisting or untwisting the line.

In Plate VII. the shot is seen slung ready for sounding.

In Plate VIII. it is in the act of being detached after having reached bottom, specimens of which will be brought up with the rod or bolt *B*, in the little cup *c*.

Lieut. Berryman thinks that the armorer on board the Dolphin suggested an improvement to this, by substituting for *c* a Stellwagen cup, and attaching that to the iron rod.

With this apparatus, specimens were obtained on board the Dolphin from the depth of 2,000 fathoms (12,000 feet). During her last cruise, her commander intrusted the deep-sea soundings to Midshipman John G. Mitchell. This officer, and the men employed with him, finally became so expert—always doubling the line for the first 300 fathoms, applying friction to the reel at first, so as to offer a little resistance to the shot for that depth, and keeping, with the help of the oars, the line up and down—that failure to get bottom seldom occurred, unless in cases where the twine had been injured by the mice, or damaged by lime getting upon it in the hold. Indeed, Lieut. Berryman informs me that they became so expert that they could tell, by feeling the line, whether the shot were pulling it out, or whether it were merely carried out by the force of the drift.

The sounding-twine is now made in the Boston Navy Yard. To have it so made, has been found the most economical. That which was furnished to the Dolphin when Lieut. Lee had her, was bought ready made. The strength of the weakest part is the strength of the whole; and so inferior did much of it prove, that, though he expended upwards of 140,000 fathoms of twine, and 116 32 lb. shot, in attempting to sound, only 73,000 fathoms of this quantity, and 30 shot, were actually employed in getting bottom; the rest were lost by the parting of the line, &c.

Commodore Morris has (by his instructions, as given on page 125) directed the small twine to be made strong enough to bear a strain of 60 lbs. It weighs about 1 lb. per 180 fathoms, and is put on reels of 10,000 fathoms.

The large twine will bear a weight of 150 lbs. It is put up for use, on reels of 5,000 fathoms. This is the twine to be generally used with Brooke's apparatus.

Seeing that, for success in deep-sea soundings, so much depends upon the interest which the officer charged with the sounding feels in the matter, it has been decided to give twine to those vessels only, that have on board some one or more officers who will volunteer to undertake a series of deep-sea soundings.

An outfit of sounding materials will be supplied to any vessel, either upon requisition of her commander, or at the request of any officer on board, who is willing to undertake a series of deep-sea soundings.

As to the *modus operandi* in sounding, officers are referred to what has already been said, and they are reminded that uniformity of method is of great consequence. Always use the same twine and the same weight; always time every 100 fathoms; always keep the line up and down, and *always* sound from a boat. The experience of the Dolphin is in favor of two 32 lb. shot, as a sinker for the small-sized twine. Her soundings, particularly those taken by Mitchell during her last cruise, are referred to by way of example.

Whenever specimens of the bottom are obtained, they should be labelled with date, name of ship and of officer, latitude, longitude, and depth, and carefully preserved and forwarded to the Chief of the Bureau of Ordnance and Hydrography.

In the North Atlantic, the deep-sea soundings that are principally required, are in the white space (Plate XIV.) to the southward of the Grand Banks; in the open space about the Bermudas; in the middle

of the Atlantic, between 25° and 30° N., 45° and 55° W., and in all the region below the parallel of 15°, except where Lee sounded.

It would be very interesting, also, to have a series of deep-sea soundings made from *boats* in the Gulf of Mexico and Caribbean Sea, to test those which were made from the vessel by Rogers Taylor, of the Albany.

The deepest parts of the ocean will probably be found south of the parallel of 35° south. Soundings by vessels bound around either of the capes, therefore, would be possessed of a peculiar interest.

As to the physical geography of the sea, it may be said we know nothing, or, only what may be gathered from a few faint rays that modern explorations have cast upon it; and the officers of the American Navy have here afforded them the rare opportunity of building up a new department in physical geography.

The problem before them is an old one. To fathom the depths of the ocean is the proposition. Heretofore, it has either appalled by its magnitude, or baffled with its difficulties. At any rate, no systematic attempts have ever been made to gauge its depths "off soundings." But now, with means the most simple, this first great problem in the physical geography of the sea seems to be in a fair way of receiving a satisfactory solution, at least so far as to enable us to form a tolerably correct idea as to the general forms of the great oceanic basins, and the troughs, which, like inverted spurs from mountain ranges, start out from the depressions in the solid crust below its waters, into bays, gulfs, and arms of the sea.

Of all contrasts in nature, perhaps none would be more striking than that afforded between the elevations of the earth's crust into mountains, on the one hand, and its depressions below the sea-level into hollows for the bed of the ocean, on the other. Certainly, few would be more grand—none can be more imposing.

I may refer to the Dolphin's abstract log,* also, for deep-sea temperatures, as well as remarks about drift.

In the vicinity of most of the vigias, Berryman reports drift-wood, sun-fish, or something which, without a close examination, and at a little distance, might well be taken for rocks or other dangers to navigation.

For deep-sea temperatures, he used non conducting hollow cylinders for bringing up the water. His experience finally induced him to repudiate the temperatures by that, and to prefer the common self-registering thermometer in its stead, notwithstanding its many liabilities to error and derangement. A self-registering metallic deep-sea thermometer seems to be the only instrument to which we may confidently look for correct knowledge concerning the thermal condition of the substrata of the deep sea.

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* This has been printed by Congress, in a neat volume entitled "The Cruise of the Dolphin," Senate, 33d Congress, 1st Session, No. 59.—(Executive.)

Passed Midshipman G. M. Morris, who had the general superintendence of this department, in a report to Lieut. Berryman at the end of the cruise, remarks:—

"Used non-conducting cylinders for obtaining the temperature of water below the surface. On 25th October, attached a self-registering thermometer to the *lower* cylinder. Upon hauling up, found temperature in cylinder 71°—self-registering thermometer showing 53°. Also, on the 26th October, attached two self-registering thermometers, one to each cylinder, first trying the temperature at surface, which we found agreed with that of the standard thermometer, 82°. On hauling up, found temperature in cylinder as noted in columns, viz: 200 fms. 80°, 500 fms. 73°—self-registering thermometer showing at 200 fms. 63°, and at 500 fms. 52°. Also, tried it again, November 4, finding temperature in cylinders 200 fms. 75°, 500 fms. 65°—self-registering thermometer showing respectively 67° and 50°.

"We infer from the above results, that the temperatures taken with the 'non-conducting cylinder' are most inaccurate; owing, I think, to the swell or heave of the sea, which causes the water to change in the cylinder during its ascent." A self-registering metallic thermometer is the only *reliable* instrument under all circumstances for deep-sea temperatures. In the absence of these, I still prefer the non-conducting cylinder with *good* valves.

163. In making these deep-sea soundings, the practice is to time the hundred fathom marks as they successively go out; and by always using a line of the same size and "make," and a sinker of the same shape and weight, we at last established the law of descent. Thus the mean of our experiments gave us, for the sinker and twine used, the results of the following tabular statements:—

Summary Statement of all Deep-Sea Soundings, as far as the Same have been received at this Office, December, 1854.

U. S. Ship Albany.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Dec. 6, 1850	38° 38′ N.	66° 31′ W.	1625*	April 10, 1851	23° 47′ N.	83° 22′ W.	593
" 9, "	33 34	61 38	1950*	" 19, "	23 21	82 44	995
" 11, "	30 05	58 52	1000*	" 21, "	25 19	83 41	52
" 11, "	29 58	58 48	1500	" 22, "	26 43	84 41	137
" 16, "	21 34	63 24	1600	" 23, "	29 12	86 01	152
" 29, "	17 54	67 28	1200	June 13, "	27 00	85 43	1310
Jan. 4, 1851	18 20	69 49	370	" 14, "	27 55	85 44	376
" 5, "	17 16	71 26	1275	" 14, "	28 27	85 54	220
" 13, "	19 12	76 05	1200	Dec. 2, "	26 25	83 23	1502†
" 16, "	22 29	84 35	420	" 10, "	27 04	79 44	380
" 16, "	22 32	84 32	720	" 11, "	27 16	79 49	274
" 28, "	24 05	82 05	470	" 11, "	27 16	79 49	284
" 29, "	24 37	79 48	500	" 11, "	27 55	79 45	440
Feb. 6, "	19 57	72 11	640	" 11, "	27 51	79 09	647
" 18, "	15 40	77 07	1300	" 11, "	27 34	77 54	631
" 19, "	11 07	79 13	600	" 12, "	27 19	77 18	690
" 28, "	17 54	80 25	895	" 12, "	27 10	76 59	1180
March 3, "	19 20	81 50	660	" 13, "	27 10	75 06	1806
" 4, "	21 25	84 45	990	" 14, "	26 31	74 10	1590
" 5, "	22 05	86 22	445	" 14, "	26 28	73 50	1778
" 16, "	19 30	94 30	530	" 15, "	25 30	72 07	4100
" 16, "	19 37	94 49	967	" 16, "	24 48	70 22	1893
April 3, "	25 56	95 51	490	" 17, "	24 41	69 39	3600†
" 4, "	26 58	92 58	725	" 19, "	22 40	69 00	2762
" 5, "	26 36	88 56	962	Jan. 9, 1852	9 44	81 01	1650
" 6, "	26 43	85 27	795	Feb. 15, "	11 23	79 36	2290
" 7, "	25 23	85 19	693	" 16, "	12 25	78 22	2320
" 8, "	24 39	85 12	916				

* No bottom. † Doubtful.

Deep-Sea Soundings on Board the U. S. Brig Dolphin. Lieutenant S. P. LEE Commanding.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Nov. 24, 1851	25° 30′ N.	37° 44′ W.	1720	Jan. 20, 1852	0° 23′ N.	21° 45′ W.	2000*
" 30, "	23 42	32 39	2180	" 22, "	2 27 S.	23 38	3020
" 30, "	23 41	32 39	2200	" 24, "	5 42	25 40	2970
Dec. 1, "	23 15	32 24	2200	" 25, "	6 59	25 43	3250
" 7, "	18 39	25 24	1970	" 27, "	4 11	24 00	3200
" 7, "	18 19	25 05	1675	" 29, "	3 33	22 38	3575
" 10, "	18 11	23 48	1612	" 31, "	2 26	20 47	3450
" 11, "	17 34	22 50	1370	Feb. 3, "	0 18 N.	18 40	2000*
" 13, "	16 29	20 58	1941	" 5, "	0 45	18 28	2680
" 14, "	16 34	20 47	1875	" 13, "	0 31 S.	17 45	2840
" 15, "	16 59	21 38	1580	" 29, "	5 32	32 43	2490
" 16, "	15 24	21 46	1220	Mar. 13, "	3 51	33 02	2150
" 16, "	15 09	22 28	1380	" 28, "	4 20	34 45	2440*
" 17, "	15 08	22 57	1120	" 31, "	4 24	35 23	2700
" 17, "	15 02	23 12	790	April 9, "	0 57 N	41 06	2980
Jan. 7, 1852	11 07	21 56	1160	" 12, "	1 06	43 43	2000*
" 7, "	11 07	21 56	1120	May 26, "	7 57	47 51	1970
" 8, "	8 43	20 52	2270	" 31, "	13 28	52 26	1960*
" 9, "	7 17	20 07	2050	" 31, "	12 47	52 57	2780
" 9, "	7 17	20 07	1940	June 2, "	12 20	54 48	2570
" 13, "	4 14	19 20	2670	" 4, "	15 25	55 01	3020
" 14, "	3 42	19 06	2760	" 8, "	19 02	59 33	3300
" 15, "	3 51	19 06	2760	" 12, "	26 32	60 06	3825
" 17, "	3 01	18 36	2725	" 14, "	24 11	61 43	3450
" 18, "	2 36	19 22	2840	" 20, "	24 36	65 12	3560
" 19, "	2 10	19 57	2750	" 28, "	36 04	73 59	1460
" 19, "	2 10	19 57	2690				

* No bottom.

Deep-Sea Soundings on Board the U. S. Brig Dolphin. Lieutenant O. H. BERRYMAN Commanding.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Oct. 4, 1852	39° 39′ N.	70° 30′ W.	1000*	July 14, 1853	50° 54′ N.	17° 02′ W.	2675
" 6, "	40 50	64 44	2200	" 16, "	46 48	21 42	2465
" 7, "	41 12	62 38	2200	" 17, "	44 42	24 35	1500
" 9, "	41 40	59 23	2600	" 18, "	44 43	24 35	1370
" 10, "	41 40	56 01	2595	" 19, "	43 47	25 24	1850
" 11, "	40 36	54 18	3450	" 20, "	45 07	26 08	1500
" 20, "	41 07	49 23	4580	" 21, "	46 26	26 55	1400
" 24, "	43 40	42 55	2700	" 22, "	45 13	27 38	1320
" 25, "	44 41	40 16	1800	" 24, "	42 44	28 20	1210
" 26, "			1500	" 25, "	40 49	29 00	1080
Dec. 26, "	33 08	16 10	2950*	" 26, "	40 48	30 02	830
Jan. 3, 1853	34 18	16 45	2298	Aug. 10, "	38 54	33 30	1500
" 9, "	36 59	19 58	2500	" 12, "	40 35	31 56	1230
" 9, "	36 49	19 54	2750	" 13, "	42 40	31 11	1680
" 29, "	30 49	27 25	1100*	" 14, "	44 52	30 38	1560
" 29, "	30 49	27 25	2200*	" 15, "	46 15	30 04	1760
Feb. 3, "	27 05	28 21	1700	" 16, "	47 58	29 35	1900
" 4, "	27 21	30 48	2580	" 21, "	49 59	17 35	2700
" 5, "	31 17	33 08	2400	" 22, "	49 57	13 16	1580
" 6, "	28 55	35 49	1880*	Sept. 18, "	47 38	9 08	1800
" 8, "	29 14	41 21	2270	" 21, "	46 32	12 49	2190
" 9, "	31 16	43 28	2080	" 23, "	44 05	13 29	2560
" 10, "	32 01	44 21	2250	" 24, "	42 07	15 29	2500
" 11, "	32 29	47 02	1950*	" 25, "	40 20	17 48	2650
" 12, "	32 55	47 58	6600*	" 26, "	39 14	19 01	2820
" 13, "	33 03	48 36	3550	" 29, "	34 23	20 57	2150
" 15, "	32 47	50 00	3250*	" 30, "	31 46	22 03	2850
" 20, "	29 26	56 42	1480	Oct. 1, "	29 12	22 50	2800
" 22, "	28 20	59 44	2900	" 3, "	23 58	24 20	2700
" 23, "	28 04	61 44	3080	" 4, "	21 06	24 38	2625
" 24, "	28 23	64 17	2518	" 5, "	18 14	24 51	2080
" 26, "	26 49	66 54	2720	" 10, "	17 02	28 08	2460
" 28, "	28 14	69 24	2950	" 11, "	18 44	29 18	2520
June 2, "	37 24	68 52	2920	" 12, "	20 02	31 06	2560
" 3, "	38 03	67 14	4920*	" 13, "	21 48	32 36	7020
" 7, "	40 34	58 30	2750	" 14, "	20 29	34 18	2850
" 10, "	41 07	54 37	2710	" 15, "	18 49	36 16	2820
" 14, "	41 43	51 31	3130	" 17, "	19 23	40 23	2580
" 17, "	42 22	50 00	1650	" 18, "	21 16	42 09	2370
" 21, "	41 09	43 40	1975	" 19, "	23 06	44 00	1760
" 24, "	39 36	41 06	2675	" 20, "	21 18	46 14	1875
" 29, "	42 10	42 04	1850	" 21, "	19 51	48 02	2240
July 2, "	46 53	37 46	2000	" 22, "	18 32	49 48	2370
" 3, "	48 16	35 22	2100	" 23, "	21 26	51 31	2300
" 4, "	49 53	31 34	1900	" 24, "	22 27	53 15	2390
" 5, "	51 40	28 33	1750	" 25, "	21 45	55 46	2900
" 6, "	53 28	25 01	1900	" 26, "	20 51	58 26	2800
" 7, "	54 17	22 33	2000	" 27, "	20 02	61 02	2810
" 9, "	57 18	16 07	620	Nov. 3, "	21 19	66 27	2960
" 12, "	54 26	12 10	1625	" 4, "	23 42	67 37	2940

* No bottom.

Deep-Sea Soundings on Board the U. S. Ship Jamestown.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Jan. 3, 1851	36° 43′ N.	74° 10′ W.	1500*	June 13, 1851	38° 50′ N.	43° 49′ W.	1600†
" 4, "	36 33	73 00	1900*	" 18, "	37 50	32 07	2000
" 5, "	37 06	68 02	2000	" 23, "	36 00	27 20	4000*
" 6, "	38 13	62 32	3700	" 24, "	35 06	26 52	2000*
" 7, "	38 50	45 33	2000				

U. S. Ship Plymouth.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Sept. 2, 1851	37° 28′ N.	56° 22′ W.	5000	Sept. 9, 1851	34° 11′ N.	43° 21′ W.	2800

U. S. Ship Portsmouth.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Dec. 31, 1851	21° 19′ N.	38° 10′ W.	4700†	Aug. 5, 1853	39° 40′ N.	139° 26′ W.	2850
Aug. 4, 1853	39 55	140 13	2500*				

U. S. Schr. Taney. *U. S. Ship Saratoga.*

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
Nov. 15, 1849	31° 59′ N.	56° 43′ W.	5700*	Nov. 28, 1850	28° 21′ S.	29° 31′ W.	3100

U. S. Ship Congress.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
June 12, 1851	28° 46′ S.	43° 46′ W.	2880	April 15, 1851	34° 50′ S.	51° 40′ W.	950
Aug. 7, "	23 59	43 44	90	May 12, "	28 00	45 58	800
April 1, "	35 20	51 30	1000	" 13, "	27 32	47 08	320
" 3, "	35 23	47 27	2550	Sept. 10, "	30 28	45 41	1780
" 9, "	34 37	44 11	2093*				

U. S. Ship John Adams.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
May 3, 1851	33° 50′ N.	52° 34′ W.	2600	May 10, 1851	31° 01′ N.	44° 31′ W.	2300
" 9, "	32 06	44 47	5500†	" 21, "	35 07	25 43	1040

* No bottom. † Uncertain.

U. S. Ship Susquehanna.				*U. S. Ship St. Louis.*			
DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
June 18, 1851	33° 35′ N.	38° 32′ W.	1800	Oct. 4, 1852	36° 16′ N.	46° 52′ W.	5070*

U. S. Steamer Saranac.

DATE.	LATITUDE.	LONGITUDE.	FATHOMS.	DATE.	LATITUDE.	LONGITUDE.	FATHOMS.
July 24, 1853	12° 09′ N.	55° 17′ W.	2435				

With the view of showing the law of descent, both from boats and ships, for the various weights used with the small twine, the following tables have been prepared by Lieutenants S. P. Lee and R. H. Wyman. This law, owing to various circumstances connected with the commencement of almost every sounding, does not begin fairly to develop itself until 400 or 500 fathoms have run out. Notwithstanding this, certain anomalies remain for which it is difficult to account. They warn us, however, of the importance of close attention to the timing of every 100 fathoms, as the marks go out, and to keeping the line up and down from the boat by aid of the oars.

Berryman's line was of a more uniform size than Lee's, which, therefore, gives the more weight to his values of the rate of descent. Though these tables exhibit anomalies which we cannot satisfactorily account for, yet they are exceedingly valuable by reason of the check and the guide they afford for our future deep-sea soundings. They admonish operators as to the importance of *always* sounding from a boat, of using the same weights and the same twine, and of timing accurately.

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* No bottom.

Time of Descent for every 100 *Fathoms. Small Line*

FATHOMS	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
December 10, 1853 . . .	1.02	1.16																	
" 10, " . . .	1.02	1.16	1.06																
" 10, " . . .	0.57	1.13	1.22	1.35															
" 11, " . . .	1.02	1.12	1.29	1.52	1.42	2.01													
" 12, " . . .	0.53	1.11	1.21	1.35	1.39	1.40													
" 12, " . . .	0.53	1.12	1.32	1.37	2.07	2.23	2.20	2.28	2.49	2.41	2.13								
" 1, " . . .	0.54	1.00	0 59	0.59	1.16	1.48	1.43	1.56	1.56	1.29	1.45	2.07	1.35	1.33	1.49				
" 13, " . . .	0.59	1.14	1 27	1.35	1.35	1.35	1.48	2.05	2.28	1.50	2.21	3.10	2.17	3.34	2.44	2.24	3.33	3.03	2.52
" 16, 1851 . . .	0.57	1.17	1.22	1.35	1.42	1.49	2.03	2.14	2.06	2.06	2.34	2.31	2.03	2.25	2.45	2.35	2.41	3.08	2.45
February 15, 1852, *a.* . .			1.04	1.21	1.46	1.51	1.33	1.59	2.11	1.39	2 03	2.17	1.52	2.21	2.04	2.02	2.40	2.09	2.23
" 16, " *b.* . .	1.00	1.13	1.22	1.18	1.26	1.36	1.46	2.02	2.09	1.41	1.40	1.50	2.25	2.43	1.59	2.10	2.51	2.12	2.57
December 19, 1851, *c.* . .	0.54	1.13	1.29	1.42	1.52	1.58	2.12	2.23	2.15	2.18	2.28	2.35	2.44	2.41	2.38	2.46	3.20	2.58	2.36
" 15, " *d.* . .	0.55	1.05	1.09	1.13	1.45	1.52	1.49	1.50	2.07	2.12	1.56	2.20	2.17	2.14	2.41	2.17	2.20	2.51	2.16
Average interval (min. & sec.)	0.52	1.12	1.18	1.29	1.35	1.51	1.54	2.07	2.15	1.59	2.07	2.24	2.10	2.32	2.23	2.22	2.54	3.03	2.38
No. of casts	12	12	11	11	10	10	8	8	8	8	8	7	7	7	7	6	6	6	6

Time of Descent for every 100 *Fathoms. Small*

	FATHOMS.											
	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
	INTERVALS.											
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
January 8, 1852 . . .	1.52	2.17	2.25	2.20								
" 20, " . . .	1.40	1.54	2.11	2.25	2.47							
" 3, " . . .	1.46	2.00	3.34	3.42	2.52	3.07	2.12					
October 25, 1851 . . .	1.43	2.06	2.21	2.40	2.59	3.00	3.17	3.42				
November 28, " . . .	1.42	1.58	2.26	2.40			3.17	3.26				
February 14, 1852 . . .	1.50	2.03	2.26	1.22	2.49	3.00	3.15	3.15				
June 9, " . . .	1.56	2.14	2.32	2.48	3.00	3.17	3.25	3.28				
December 17, 1851 . . .	1.55	2.05	2.22	2.33	2.52	2.17	3.09	3.39	3.28			
June 9, 1852 . . .	1.52	2.10	2.30	2.40	2.56	3.08	3.09	3.37	3.41	4.54		
December 16, 1851 . . .	1.53	2.15	2.26	2.39	2.40	3.00	3.10	3.15	3.19	3.31	3.39	
February 18, 1852 . . .	1.50	2.20	2.44	2.58	3.08	3.20	3.37	3.41	3.46	3.55		
" 15, " . . .	1.46	2.01	2.14	2.33	2.43	2.52	3.03	3.15	3.23	3.29	3.39	3.47
December 14, 1851 . . .	1.49	2.06	2.20	3.20	2.00	2.18	4.02	3.20	3.30	3.35	4.03	4.22
January 10, 1852 . . .	1.45	2.00	2.14	2.28	2.40	2.59	3.04	3.16	3.16	3.32	3.39	3.50
December 7, 1851 . . .	2.14	2.29	2.42	2.53	3.00	3.15	3.20	3.30	3.55	4.09	3.51	3.58
January 10, 1852 . . .	1.50	2.06	2.21	2.35	2.45	2.58	3.09	3.25	3.25	3.32	3.38	3.48
May 31, " . . .	1.54	2.11	2.16	2.34	2.49	2.52	3.14	3.22	3.28	3.50	3.56	4.02
November 30, 1851 . . .	2.05	2.41	2.17	3.12	3.10	3.20	3.40	3.45	3.55	4.10	4.10	4.40
January 8, 1852 . . .	1.47	2.08	2.19	2.29	2.50	2.50	2.52	3.28	3.23	3.44	3.37	3.58
" 20, " . . .	1.43	1.50	1.57	2.32	2.25	2.43	2.45	2.42	2.56	2.56	2.52	3.08
April 12, " . . .	2.13	2.32	2.48	2.52	3.15	3.20	3.46	3.56	3.59	4.11	4.13	4.24
January 23, " . . .	2.01	2.14	2.29	2.52	2.54	3.03	3.12	3.22	3.22	3.30	3.44	3.53
" 21, " . . .	1.54	2.12	2.26	2.30	2.50	3.06	3.20	3.31	3.36	3.51	4.00	4.06
" 9, " . . .	1.48	2.05	2.22	2.17	2.52	2.57	3.17	3.07	3.31	3.33	3.42	3.45
June 21, " . . .	1.44	2.01	2.15	2.39	2.46	3.00	3.08	3.27	3.40	3.50	3.40	3.55
January 13, " . . .	1.40	1.47	2.11	2.32	2.39	2.54	3.08	3.09	3.27	3.35	3.39	3.53
" 14, " . . .	1.40	1.56	2.12	2.25	2.37	2.34	2.55	3.05	3.22	3.36	3.35	3.48
" 17, " . . .	1.56	2.11	2.27	2.42	2.59	3.09	3.19	3.29	3.39	3.45	3.59	3.57
" 22, " . . .	1.57	2.25	2.35	2.40	2.59	3.00	3.20	3.19	3.21	3.34	3.38	3.47
Average interval . .	1.51	2.09	2.25	2.39	2.49	2.58	3.13	3.24	3.31	3.45	3.45	3.57
No. of casts	29	29	29	29	27	26	27	26	22	21	19	18

waxed; one 32 lb. shot. From U. S. Ship Albany.

	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300
	3.27																							
a.	2.52	1 59	2.33	2.55	1.58																			
b.	1.06	3.45	3.23	4.49	2.41																			
c.	3.20	3.29	3.11	3.25	3.16	3.19	3.19	2.23	4.15	3.01														
d.	2.40	3.55	2.31	3.02	2.59	2.26	2.56	3.15	2.39	3.36	2.35	3.00	3.09	2.52	3.13	2.47	3.14	2.42	3.16	2.56	3.22	2.48	2.51	4.10
	2.41	3.17	2.39	3.35	2.43	2.52	3.07	2.49	3.27	3.18	2.35	3.00	3.09	2.52	3.13	2.47	3.14	2.42	3.16	2.56	3.22	2.48	2.51	4.10
	5	4	4	4	4	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Line; one 32 lb. shot. Boat Dolphin—(Lee).

FATHOMS.															
1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
INTERVALS.															
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
4.35															
3.51															
4.20	4.21	4.21	4.28												
4.01	4.18	4.08	4.17												
4.27	4.05	4.35	4.28	4.46											
4.01	4.08	4.28	4.14	3.44											
4.16	4.30	4.23	4.28	5.07											
4.25	4.41	4.43	4.50	4.53	4.57										
4.15	4.11	4.34	4.32	4.32	4.28										
3.07	3.28	3.26	3.21	3.32	3.34										
4.38	4.41	4.38	5.32	4.48	5.16										
3.50	3.56	4.11	4.16	4.26	4.49	4.48									
4.09	4.21	4.35	4.25	4.50	4.59	5.09									
4.00	4.16	4.09	4.23	4.34	4.44	4.34	4.49								
4.13	4.18	4.39	4.35	4.49	4.54	5.19	5.01	5.11							
4.04	4.04	4.14	4.19	4.29	4.45	4.44	4.49	4.50	5.07	5.08					
3.55	4.04	4.08	4.30	4.23	4.29	4.49	4.53	5.05	5.04	5.17	5.15	6.31			
4.02	4.18	4.21	4.39	4.45	4.47	4.49	5.03	5.06	5.06	5.17	5.25	5.42			
3.58	4.03	4.01	4.08	4.02	4.11	4.08	4.15	4.16	5.36	4.21	4.08	4.09	4.30	4.44	4.40
4.07	4.13	4.20	4.26	4.31	4.39	4.47	4.48	4.54	5.13	5.01	4.56	5.27	4.30	4.44	4.40
·19	17	17	17	15	12	8	6	5	4	4	3	3	1	1	1

Time of Descent for every 100 *Fathoms.*—*Small Line*

	FATHOMS.															
	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800
	INTERVALS.															
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
June 28, 1852 . .			1.52	2.07	2.15	2.23	2.33	2.40	2.48	2.51	3.02	3.06				
May 26, " . .	1.36	1.45	1.55	2.07	2.14	2.24	2.38	2.49	2.53	3.11	3.06	3.19	3.14	3.15	3.20	3.35
" 24, " . .	1.37	1.43	2.11	2.24	2.28	2.30	2.53	2.57	3.05	3.08	3.20	3.22	3.38	3.38	3.51	3.50
Feb. 3, " . .	1.46	1.59	2.15	2.19	2.26	2.40	2.52	2.58	3.02	3.10	3.12	3.14	3.28	3.18	3.25	3.18
" 4, " . .	1.39	1.55	2.07	2.18	2.35	2.39	2.47	3.19	3.02	2.48	2.54	3.01	3.06	3.16	3.32	3.56
" 16, " . .	1.33	1.54	2.05	1.29	2.25	2.33	2.42	2.55	3.00	3.04	3.13	3.19	3.19	3.31	3.30	3.32
March 13, " . .	1.43	1.53	2.06	2.17	2.29	2.28	2.47	2.50	3.07	3.07	3.11	3.24	3.32	3.30	3.30	3.42
" 28, " . .	1.38	1.49	2.00	2.08	2.14	2.25	2.32	2.37	2.45	2.58			3.12	3.11	3.16	3.14
Feb. 29, " . .	1.39	1.57	2.10	2.19	2.25	2.43	2.49	2.53	3.07	3.18	3.27	3.40	3.46	3.47	4.00	4.07
June 2, " . .	1.44	1.52	2.05	2.18	2.30	2.35	2.49	2.49	2.52	2.57	3.09	3.20	3.15	3.27	3.36	3.46
Feb. 5, " . .	1.16	1.25	1.33	1.34	1.42	1.44	1.50	1.59	2.07	2.07	2.13	2.20	2.21	2.28	2.37	2.42
Jan. 15, " . .	1.27	1.41	1.44	1.14	1.48	1.53	1.58	2.03	2.07	2.08	2.15	2.20	2.23	2.30	2.27	2.32
" 18, " . .	1.41	1.51	2.03	2.11	2.23	2.34	2.41	2.41	2.52	2.59	3.10	3.15	3.28	3.23	3.28	3.33
March 31, " . .	2.07	2.23	2.29	2.46	2.56	3.06	3.13	3.14	3.20	3.33	3.36			3.53	4.05	3.44
May 31, " . .	1.35	1.55	2.10	2.20	2.30	2.55	3.00	3.05	3.15	3.15	3.25	3.35	3.40	3.50	4.45	4.00
Feb. 13, " . .	1.47	2.05	2.15	2.29	2.29	2.38	2.53	2.55	3.10	3.10	3.16	3.30	3.30	3.32	3.30	3.46
Jan. 24, " . .	1.35	1.49	1.59	2.14	2.16	2.27	2.30	2.41	2.47	2.55	3.05	3.12	3.15	3.18	3.22	3.28
April 9, " . .	1.42	1.56	2.11	2.16	2.38	2.43	2.42	2.15	2.57	3.05	3.05	3.07	3.47	3.52	3.49	3.55
June 4, " . .	1.42	2.07	2.03	2.19	2.37	2.39	2.52	3.09	3.20	3.24	3.33	3.48	3.44	3.49	4.06	4.19
Jan. 25, " . .	1.37	1.48	1.52	1.58	2.20	2.14	2.21	1.58	2.39	2.43	2.52	2.50	3.03	3.11	3.17	3.17
" 27, " . .	1.40	2.00	2.05	2.13	2.22	2.30	2.38	2.47	2.55	2.58	3.12	3.12	3.16	3.25	3.31	3.43
June 6, " . .	1.41	1.55	2.04	2.15	2.25	2.33	2.38	2.47	2.52	3.00	3.05	3.20	3.19	3.26	3.33	3.38
" 8, " . .	1.48	2.00	2.12	2.20	2.28	2.42	2.52	2.55	3.08	3.15	3.20	3.20	3.35	3.36	3.49	3.50
Jan. 31, " . .	1.45	2.09	2.31	2.43	3.00	3.12	3.17		3.30	3.33	3.46	3.55	3.44		4.16	4.15
June 14, " . .	1.19	1.28	1.40	1.48	1.53	2.02	2.20	2.28	2.32	2.50	2.50	2.58	3.01	3.02	3.08	3.26
Jan. 29, " . .	1.50	1.59	2.12	2.14	2.45	3.22	2.53	2.48	2.57	3.02	3.14	3.17	3.18	3.14	3.25	3.28
June 12, " . .		1.41	1.49	1.51	1.58	2.02	2.10	2.14	2.26	2.32	2.32	2.34	2.42	2.36	2.43	2.41
Average interval	1.39	1.53	2.03	2.10	2.23	2.32	2.40	2.43	2.54	3.00	3.07	3.12	3.18	3.21	3.31	3.35
No. of casts . .	25	26	27	27	27	27	27	26	27	27	26	25	25	25	26	26

waxed; one 32 lb. shot. Boat Dolphin—(Lee).

FATHOMS.																			
1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800
INTERVALS.																			
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
3.45																			
3.46	2.49																		
4.02	4.11																		
3.42	3.57																		
4.02	3.50	3.51																	
3.24	3.25	3.43			3.38														
4.13	4.15	4.23	4.33	4.46	4.40														
3.54	3.58	3.39	3.50	4.02	4.07	4.10													
2.45	2.52	2.50	2.50	3.06	3.07	3.17	2.50												
2.39	2.45	2.42	2.54	2.54	2.51	3.01	2.57	3.12											
3.36	3.50	3.50	4.07	4.06	4.12	4.06	4.14	4.32											
3.51	3.32	4.03	3.55	3.38	2.56	3.53	4.12	4.39											
3.00	3.59	4.01	4.00	4.15	4.10	4.20	4.15	4.20											
4.25	3.39	4.11	4.01	4.03	3.35	3.59	4.02	4.15	5.47										
3.29	3.35	3.43	3.44	3.50	3.56	4.04	3.59	4.13	4.22	4.21									
4.02	3.58	3.05	4.05	3.40	5.27	4.50	4.15		4.20	4.30									
4.06	4.15	4.15	4.25	4.15	4.59	4.41	4.48	4.52	5.00	4.53	5.28								
3 30	3.31	3.37	3.37	3.48	3.44	3.57	3.58	4.00	4.02	4.00	4.13	4.11	4.10						
3.48	3.54	4.11	3.50	4.01	4.07	4.07	4.24	4.26	4.21	4.47	4.35	5.34	5.52						
3.45	3.49	3.52	4.00	4.07	4.11	4.15	4.25	4.26	4.29	4.29	4.34	5.12	5.12						
3.54	3.56	4.00	4.06	4.23	4.16	4.25	4.27	4.40	4.36	4.32	4.35	4.52	5.03	6.15					
4.24	4.27			4.24	4.17	4.47	4.49	5.10	4.57	5.00	5.18	5.27	6.48	7.25	8.07				
3.30	3.35	3.38	3.39	3.46	3.52	4.02	4.08	4.12	4.16	4.24	4.31	4.31	4.36	4.37	4.39				
3.29	3.33	3.38	3.34	3.40	3.33	3.34	3.31	3.43	4.07	5.25	4.08	4.20	4.59	4.39	5.09	4.22			
2.44	2.44	2.46	2.51	2.53	2.59	3.07	3.07	3.08	3.08	3.09	3.10	3.10	3.10	3.12	3.13	3.20	3.23	3.28	3.34
3.40	3.40	3.41	3.46	3.52	3.55	4.01	4.01	4.15	4.27	4.30	4.30	4.39	4.58	5.13	5.17	3.51	3.23	3.28	3.34
25	24	20	18	19	20	18	17	15	12	11	9	8	8	5	4	2	1	1	1

Time of Descent for every 100 *Fathoms. Two* 32 *lb.*

	FATHOMS.									
	300	400	500	600	700	800	900	1000	1100	1200
	INTERVALS.									
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
November 23, 1851 . . .	1.30	1.38	1.50	2.10						
" 30, " . . .	1.20	1.34	1.46	2.00						
December 14, " . . .	1.35	1.47	1.56	2.00						
January 3, 1852 . . .	1.23	1.31	1.45	1.49						
" 6, " . . .	1.18	1.30	1.40	1.45						
" 14, " . . .	1.09	1.18	1.33	1.38						
November 30, " . . .	1.21	1.34	1.40	1.56	2.02					
December 16, " . . .	1.49	1.17	1.58	2.03	2.07					
" 17, " . . .	1.30	1.37	1.50	1.59	2.10					
January 20, " . . .	1.11	1.24	1.18	1.37	2.07					
November 28, " . . .		1.47	2.00	2.01	2.17	2.15				
January 9, " . . .	1.16	1.27	1.34	1.43	1.54	2.01				
" 7, " . . .	1.18	1.32	1.40	1.47	1.52	1.58	2.08	2.15	2.26	
" 7, " . . .	1.15	1.25	1.30	1.42	1.53	1.58	2.10	2.14	2.24	
November 30, " . . .	1.13	1.34	1.38	1.37	1.52	1.50	2.00	2.03	2.04	2.12
December 16, " . . .	1.24	1.41	2.48	1.57	2.42	1.16	2.22	2.33	2.39	2.39
January 13, " . . .	1.10	1.20	1.32	1.43	1.48	2.02	2.10	2.17	2.20	2.33
December 15, " . . .	1.30	1.40	2.14	1.46	2.16	2.19	2.18	2.27	2.42	2.40
" 7, " . . .	1.31	1.41	1.55	1.47	2.01	2.50	2.21	2.26	2.37	3.37
" 10, " . . .	1.32	1.45	1.53	2.01	2.11	2.17	2.20	2.33	2.40	2.38
November 24, " . . .	1.28	1.42	2.15	2.30	2.13	2.27	2.27	2.43	2.40	2.25
December 13, " . . .	1.35	1.42	1.53	2.00	2.02	2.17	2.12	2.38	2.35	2.42
January 9, " . . .	1.19	1.33	1.41	1.48	1.55	2.10	2.13	2.21	2.31	2.38
December 1, " . . .	1.30	1.44	1.58	2.04	2.13	2.23	2.30	2.46	2.49	2.47
January 12, " . . .	1.02	1.07	1.13	1.19	1.25	1.28	1.36	1.35	1.41	1.44
November 30, " . . .	1.28	1.42	1.53	1.57	2.09	2.19	2.29	2.30	2.39	2.50
January 11, " . . .	1.14	1.30	1.40	1.46	1.59	2.03	2.14	2.20	2.29	2.36
" 19, " . . .	1.16	1.24	1.34	1.42	1.52	2.02	2.13	2.19	2.23	2.28
Average interval . . .	1.22	1.33	1.47	1.52	2.03	2.06	2.14	2.22	2.29	2.36
No. of casts	27	28	28	28	22	18	16	16	16	14

shot; Small Line. U. S. Brig Dolphin—(Lee).

FATHOMS.													
1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600
INTERVALS.													
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
2.41	3.44												
2.46	2.51	3.00											
		3.16	3.21										
2.52	2.37	2.48	3.05										
2.41	3.11	3.08	3.40	3.25									
2.49	2.55	3.00	3.06	3.09	3.17	3.28							
2.47	2.58	2.57	3.00	3.13	3.10	3.17							
3.06	3.07	3.24	3.22	3.25	3.45	3.39	3.50	3.55					
1.47	1.48	1.52	1.57	1.56	2.04	2.07	2.10	2.15					
2.57	3.10	3.12	3.21	3.27	3.29	3.46	3.39	3.47	3.52				
2.39	2.51	2.56	3.00	3.13	3.12	3.24	3.29	3.29	3.36	3.40	3.40	3.57	
2.32	2.38	2.47	2.48	2.58	3.01	3.03	3.12	3.18	3.17	3.23	3.24	3.34	3.43
2.41	2.54	2.56	3.04	3.06	3.08	3.15	3.16	3.21	3.25	3.31	3.32	3.45	3.43
11	11	11	10	8	7	7	5	5	3	2	2	2	1

Table showing the Intervals of Descent for every 100 *Fathoms.*

	FATHOMS.																				
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100
	INTERVALS.																				
DATE.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
October 7, 1852 . .	1.05	1.22	1.38	1.45	1.55	2.09	3.46	2.08	2.28	2.38											
February 2, 1853 . .	1.00	1.00	1.30	1.30	1.55	1.50	2.00	4.35[1]	2.40	2.40	2.50	3.00	3.00	3.00	3.20	3.00					
October 25, 1852 . .	1.00	1.20	1.40	2.15	2.30	1.15[1]	2.10	2.30	1.30[1]	2.30	3.30	3.00	3.30	3.15	2.25[1]	3.00[1]	3.40	3.40			
February 9, 1853 . .	0.59	1.09	1.20	1.35	1.51	1.57	2.05	2.20	2.27	2.45	2.41	2.47	3.08	3.11	3.17	3.34	3.32	3.36	3.53	3.49	4.00
January 3, " . .	0.56	1.12	1.25	1.36	1.44	1.52	2.03	2.10	2.17	2.32	2.39	2.46	3.00	3.00	3.06	3.09	3.17	3.28	3.35	3.40	3.45
" 29, " . .	1.00	1.16	1.29	1.43	1.51	2.01	2.09	2.22	2.38	2.36	3.08	3.01	3.04	3.21	3.09	3.22	3.41	3.44	3.50	4.10	4.00
" 30, " *a.* .	1.00	1.15	1.31	1.42	1.57	2.06	2.17	2.23	2.37	2.43	2.47	3.00	3.04	3.18	3.22	3.25	3.31	3.54	3.38	3.45	3.55
February 5, " *b.* .	0.45	1.00	1.45	1.40	1.50	2.00	2.10	2.40	2.30	2.45	2.50	3.01	3.15	3.05	3.20	3.45[1]	3.35	3.40	3.50	4.20	4.10
October 10, 1852, *c.* .	1.15	1.28	1.40	1.57	2.00	2.18	2.22	2.30	2.50	2.50	3.45	2.50	3.15	3.30	3.30	3.25	3.25	3.30	3.50	4.05	4.05
January 9, 1853, *d.* .	0.59	1.18	1.28	1.40	1.55	1.59	2.11	2.20	2.28	2.32	2.49	2.55	2.53	3.23	2.58	3.19	3.18	3.34	3.26	3.30	4.02
February 4, " *e.* .	0.40	1.00	1.20	1.30	1.50	2.05	2.05	2.30	2.15	2.35	2.30	2.50	2.55	3.00	3.05	3.20	3.30	3.30	3.30	3.40	3.40
January 9, " *f.* .	0.45	1.15	1.25	1.35	2.00	1.50	2.10	2.10	2.20	2.30	3.00	2.45	2.55	3.00	3.00	3.30	3.00	3.20	3.10	3.25	3.55
October 24, 1852, *g.* .	1.01	1.34	1.33	1.47	2.00	2.05	2.16	2.20	2.37	2.51	2.53	3.09	3.11	3.19	3.25	3.33	3.43	3.45	3.56	4.02	4.07
" 9, " *h.* .	4.03[1]	1.40	2.06	2.08	2.32	2.38	2.47	2.55	3.11	3.23	3.31	3.34	3.41	3.45	3.48	3.47	3.45	3.51	3.53	4.08	4.05
" 11, " *i.* .	1.05	1.29	1.40	1.53	2.08	2.19	2.29	2.37	2.42	2.48	2.55	3.09	3.16	3.25	3.23	3.29	3.28	3.32	3.39	3.41	3.49
" 20, " *k.* .	1.00	1.00	2.00	1.40	1.50	2.30	2.10	2.30	2.20	2.30	2.30	3.15	2.18	2.27	2.45	2.55	2.20	3.10	3.40	3.40	4.10[1]
February 13, 1853, *l.* .		1.16	1.32	1.31	1.50	2.00	2.22	2.07	2.38	2.39	2.36	3.00	3.00	3.00	3.20	3.30	3.30	3.40	3.50	3.50	3.50
" 23, " *m.* .			1.35	1.45	1.54	1.58	2.10	2.23	2.27	2.30	2.35	2.50	2.55	3.00	3.15	3.09	3.16	3.25	3.28	3.37	3.40
" 26, " *n.* .	0.55	1.20	1.40	2.50	2.00	1.48[1]	2.24	2.36	2.37	2.42	2.55	3.03	3.04	3.21	3.13	3.44[1]	3.31	3.42	3.48	4.12	3.58
Average interval .	0.55	1.16	1.35	1.47	1.58	2.06	2.19	2.25	2.33	2.40	2.55	2.59	3.05	3.11	3.15	3.22	3.25	3.35	3.41	3.51	4.03
No. of casts . . .	16	18	19	19	19	17	19	18	18	19	18	18	18	18	17	15	17	17	16	16	15

[1] The times marked with a small figure ([1]) are omitted in the means, as evidently incorrect.

Time of Descent for every 100 *Fathoms. Two* 32 *lb. shot;*

	FATHOMS.													
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
	INTERVALS.													
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
August 12, 1853	1.00	1.20	1.33	3.40	2.02	2.12	2.22	2.25	2.38	2.58	2.50			
July 24, "	1.06	1.26	1.40	1.50	2.00	2.10	2.25	2.30	2.40	2.50	3.00	3.10		
" 21, "	1.00	1.20	1.35	1.45	2.00	2.10	2.20	2.30	2.50	2.45	2.55	3.05	3.15	3.25
" 20, "	1.00	1.20	1.35	1.45	1.55	2.05	2.16	2.26	2.36	2.46	2.54	2.47	3.05	3.15
October 11, "	1.03	1.20	1.35	1.44	1.54									
August 10, "	1.00	1.21	1.39	1.48	1.55	2.07	2.19	2.21	2.38	2.37	2.48	2.57	3.10	3.25
" 14, "	1.00	1.12	1.25	1.37	1.50	2.06	2.08	2.20	2.34	2.48	2.48	2.58	3.00	3.20
June 17, "	0.56	1.15	1.27	1.33	1.54	1.57	2.08	2.16	2.31	2.33	2.35	2.45	2.52	3.00
" 21, "	1.19	1.28	1.41	1.51	2.01	2.14	2.28	2.34	2.44	2.51	3.07	3.09	3.16	3.53
August 15, "	1.00	1.20	1.35	1.35	1.50	2.00	2.10	2.20	2.30	2.30	2.30	2.45	2.55	3.00
July 4, "	0.55	1.15	1.30	1.40	1.50	2.00	2.12	2.24	2.24	2.35	2.45	2.45	2.55	3.05
" 2, "	1.05	1.25	1.35	1.47	1.58	2.13	2.26	2.43	2.33	2.49	2.55	3.00	3.05	3.13
October 2, "	1.03	1.17	1.30	1.44	1.56	2.05	2.18	2.27	2.47	2.41	2.52	3.06	3.14	3.30
September 21, "	1.00	1.17	1.36	1.47	2.00	2.05	2.13	2.22	2.33	2.50	2.50	3.00	3.10	3.05
July 16, " *a.*	1.05	1.20	1.35	1.50	2.05	2.10	2.15	2.25	2.35	2.45	2.45	2.45	2.55	3.05
September 23, " *b.*	0.40	1.10	1.20	1.35	1.45	1.55	1.55	2.10	2.20	2.30	2.30	2.40	2.35	3.00
" 24, " *c.*	1.02	1.18	1.30	1.42	1.58	2.08	2.08	2.28	2.38	2.48	2.52	2.58	3.00	3.05
June 10, " *d.*	1.13	1.22	1.35	1.45	1.50	1.56	2.09	2.15	2.20	2.27	2.38	2.51	2.54	2.55
" 24, " *f.*	0.58	1.17	1.35	1.42	1.53	2.03	2.14	2.25	2.25	2.38	2.50	3.00	3.02	3.03
" 7, " *g.*	0.56	1.14	1.25	1.40	1.50	1.53	2.02	2.10	2.25	2.25	2.30	2.42	2.43	2.50
October 3, " *h.*	1.03	1.15	1.29	1.39	1.42	2.00	2.00	2.08	2.20	2.30	2.35	2.40	2.45	2.50
November 4, " *k.*	1.06	1.19	1.37	1.50	2.14	2.12	2.25	2.40	2.48	2.54	3.06	3.21	3.20	3.35
June 14, " *l.*	1.14	1.29	1.42	1.53	2.01	2.11	2.18	2.35	2.39	2.42	2.48	2.56	3.00	3.05
Average interval	1.02	1.19	1.33	1.49	1.55	2.05	2.15	2.24	2.34	2.41	2.48	3.01	3.01	3.10
No. of casts	23	23	23	23	23	22	22	22	22	22	22	21	20	20

Two 32 lb. shot; Small Line. From Boat Dolphin—(Berryman).

	FATHOMS.																							
	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300	4400	4500
	INTERVALS.																							
	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.
	3.47																							
	4.00																							
a.	3.59	4.01	4.15																					
b.	4.10	4.00	4.00																					
c.	4.00	4.00	3 51[1]	4.47																				
d.	4.04	3.51	3.49	4.09																				
e.	3.55	4.15	4.00	4.05	4.00																			
f.	3.30	3.40	4.20	3.50	4.10	4.00																		
g.	4.13	4,18	4.30	4.39	4.52	5.08																		
h	4.15	4.14	4.26	4.49	4.53																			
i	4.06	4.18	4.18	4.21	4.24	4.23	4.25	4.30	4.36	4.39	4.44	4.46	4.50											
k.	3 00[1]	3.50	4.10	6.20[1]	5.15	2.15[1]	3.30	3.30	7.10[1]	5.50	7.20[1]	4.10	7.00[1]	5.10	4.20	5.05	6.45	7.30	6.50	6.55	5.15	8.00	7.00	6.50
l	4.00	4.20	4.10	4.10	4.00	4.10	6.00[1]	12 20[1]	9 00[1]	12.20[1]	13.30[1]	13.00[1]	14.15[1]	12.15[1]										
m.	3.48	3.57	3.52	3.58	4.02	4.13	4.15	4.35	4.30															
n.	3.52	4.00	4.35	4.30	4.25	4.25	4.30																	
	3.58	4.03	4.12	4.19	4.27	4.28	4.10	4.09	4.33	5.14	4.44	4.28	4.50	5.10	4.20	5.05	6.45	7.30	6.50	6.55	5.15	8.00	7.00	6.50
	14	13	12	10	9	6	4	3	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1

Small Line. From Boat Dolphin—(Berryman).

	FATHOMS.															
	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
	INTERVALS.															
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
	3.25															
	3.20															
	3.19															
	3.04	3.14	4.00													
	3.33	3.38	3.42	3.50												
	3.00	3.10	3.30	4.10												
	3.05	3.10	3.22	3.22	4.06											
	3.22	3.33	3.17	3.33	3.42	3.55										
	3.30	3.30	3.50	3.45	4.00	3.55	4.05									
	3.15	3.15	3.25	4.00	3.50	3.55	3.35	4.20								
a.	3.10	3.15	3.20	3.25	3.30	3.36	3.47	3.47	3.55	3.55						
b.	3.10	3.20	3.20	3.30	3.30	3.45	3.55	3.50	4.00	4.10	4.20					
c.	3.15	3.15	3.30	3.30	3.40	3.50	4.00	4.00	4.00	4.15	4.25					
d.	3.10	3.20	3.21	3.26	3.28	3.32	3.46	3.47	3.52	4.02	4.02	4.08				
f.	3.12	3.53	3.30	3.42	3.46	3.32	3.45	3.57	4.07	4.01	3.38	4.52				
g.	3.00	3.05	3.08	3.12	3.20	3.35	3.45	3.50	3.55	3.45	4.00	4.03	4.07			
h.	3.55	3.19	3.29	3.21	3.11	3.26	3.50	3.36	3.37	3.45	4.45	4.15	3.45			
k.	3.36	3.33	3.56	3.54	4.07	4.17	4.15	4.41	4.27	4.37	4.56	4.40	5.10	4.51	5.15	
l.	3.10	3.14	3.27	3.24	3.43	3.43	3.48	3.38	3.40	3.50	4.40	4.03	4.40	4.50	4.17	4.17
	3.14	3.18	3.30	3.36	3.41	3.45	3.51	3.57	3.58	4.02	4.16	4.20	4.25	4.50	4.45	4.17
	19	16	16	15	13	12	11	10	9	9	8	6	4	2	2	1

Time of Descent for every 100 *Fathoms. One* 32 *lb. shot;*

	FATHOMS.											
	100	200	300	400	500	600	700	800	900	1000	1100	1200
	INTERVALS.											
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
October 22, 1853, *a*. . . .	1.00	1.25	1.45	2.00	2.13	2.21	2.32	2.45	2.55	3.03	3.07	3.27
" 20, " . . .	0.53	1.17	1.40	2.01	2.10	2.23	2.26	2.47	2.51			3.42
" 23, " *b*. . . .	1.11	1.30	1.51	2.09	2.25	2.41	2.50	3.06	3.15	3.24	3.41	3.46
" 18, " *c*. . . .	1.03	1.24	1.44	2.00	2.20	2.32	2.47	2.55	3.04	3.13	3.25	3.37
" 13, " *d*. . . .	1.10	1.27	1.45	2.07	2.24	2.34	2.51	3.03	3.06	3.17	3.25	3.38
" 27, " *e*. . . .	0.55	1.21	1.44	1.56	2.17	2.32	2.35	2.46	2.56	3.04	3.14	3.15
Average interval . . .	1.02	1.24	1.45	2.02	2.18	2.30	2.40	2.54	3.01	3.12	3.22	3.34
No. of casts	6	6	6	6	6	6	6	6	6	5	5	6

Average Time of Descent for every 100 *Fathoms. Two* 32 *lb. shot; Small Line.* From

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
Mean of soundings—(Lee) . . .			1.22	1.33	1.47	1.52	2.03	2.06	2.14	2.22	2.29	2.36	2.41	2.54	2.56	3.4	3.6	3.8	3.51
" " (Berryman) .	0.56	1.16	1.35	1.47	1.58	2.06	2.19	2.25	2.33	2.40	2.55	2.59	3.05	3 11	3.15	3.22	3.25	3.35	3.41
" " " .	1.02	1.19	1.33	1.49	1.55	2.05	2.15	2.24	2.34	2.41	2.48	3.01	3.01	3.10	3.14	3.18	3.30	3.36	3.41
Average interval	0.58	1.17	1.30	1.43	1.53	2.01	2.12	2.18	2.27	2.34	2.44	2.52	2.56	3.05	3.08	3.14	3.23	3.26	3.32
No. of casts	39	41	69	70	70	67	63	58	56	57	56	53	49	49	47	41	41	39	36

Table showing the Intervals of Descent for every 100 *Fathoms. One* 32 *lb. shot; Small Line.*

	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
Mean of soundings—(Lee)			1.51	2.09	2.25	2.39	2.49	2.58	3.13	3.24	3.31	3.45	3.45	3.57
Mean of soundings—(Berryman)	1.02	1.24	1.45	2.02	2.18	2.30	2.40	2.54	3.01	3.12	3.22	3.34	3.41	3.43
Average interval	1.02	1.24	1.12	2.05	2.21	2.34	2.44	2.56	3.07	3.18	3.26	3.39	3.43	3.50
No. of casts . .	6	6	35	35	35	35	33	32	33	31	27	27	24	24

Small Line. From Boat Dolphin—(BERRYMAN).

FATHOMS.

	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800
INTERVALS.																
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
a.	3.37	3.37	3.57	4.02	4.14	4.22	4.13	4.37	4.44	4.47						
	3.30	3.27	3.41			4.10	4.16				4.52	5.15				
b.	4.06	4.06	4.26	4.28	4.33	4.42	4.49	5.02	5.06	5.12	5.26					
c.	3.46	3.53	4.02	3.57	4.20	4.23	4.22	4.36	4.47	4.30	5.03	5.00				
d.	4.19*	3.57	4.01	4.17	4.24	4.30	5.03	4.35	4.47	5.25	5.02	5.02	5.26	5.29	5.41	
e.	3.27	3.19	3.29	3.36	4.04	3.51	4.05	4.04	4.13	4.21	4.21	4.25	4.37	4.26	4.38	4.47
	3.41	3.43	3.54	4.04	4.19	4.20	4.28	4.35	4.43	4.51	5.08	4.55	5.01	4.58	5.09	4.47
	5	6	6	5	5	6	6	5	5	5	5	4	2	2	2	1

Mean of Soundings by Lieutenants S. P. LEE and O. H. BERRYMAN, 1851–52–53.

2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300	4400	4500
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
3.16	3.21	3.25	3.31	3.32	3.45	3.43																			
3.51	4.03	3.58	4.03	4.12	4.19	4.27	4.28	4.10	4.09	4.33	5.14	4.44	4.28	4.50	5.10	5.20	5.05	6.45	7.30	6.50	6.55	5.15	8.00	7.00	6.50
3.45	3.51	3.57	3.58	4.02	4.16	4.20	4.25	4.50	4.45	4.17															
3.37	3.45	3.47	3.51	3.55	4.06	4.10	4.26	4.30	4.27	4.25	5.14	4.44	4.28	4.50	5.10	5.20	5.05	6.45	7.30	6.50	6.55	5.15	8.00	7.00	6.50
33	31	27	24	23	20	16	11	6	5	3	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1

From Mean of Soundings by Lieutenants S. P. LEE and O. H. BERRYMAN, 1851–52–53.

1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
4.07	4.13	4.20	4.26	4.31	4.39	4.4	4.48	4.54	5.13	5.01	4.56	5.27	4.30	4.44	4.40
3.54	4.04	4.19	4.20	4.28	4.35	4.43	4.51	5.08	4.55	5.01	4.58	5.09	4.47		
4.00	4.08	4.19	4.23	4.29	4.37	4.45	4.49	5.01	5.04	5.01	4.57	5.18	4.38	4.44	4.40
25	22	22	23	21	17	13	11	10	8	6	5	5	2	1	1

It will be remarked how much more rapidly the line went out from the Albany, than it did to the same weight (one 32 lb. shot) from the Dolphin's boat.

It will be also noted, how very uniform is the rate of descent in the last of the Dolphin's tables, and in which two 32 lb. shot were used. This was on her last cruise, when the soundings were intrusted entirely to one officer—young Mitchell—and when the boat's crew had become so *au fait* at the business, that they claimed to tell by "the feel" of the line when the shot touched bottom. These results are highly satisfactory; they do Mitchell great credit, and I point to them as a model for others.

It is very evident that a shot will sink at the same rate, whether it be dropped overboard from a ship or a boat. We account, then, for the apparently more rapid rate of descent from the Albany, by the greater drift of the vessel; for, of course, as she fell off and gathered headway, she slipped from under the line, which increased its rate of going out. We, therefore, are forced to the conclusion that the Gulf of Mexico and Caribbean Sea are not so deep as, from the Albany's soundings, these two basins were supposed to be.

Indeed, the ocean generally is not quite so deep as this system of deep-sea soundings would represent it. The under currents operate upon the line; it bends to them, and of course the sounding reported is rarely, if ever, a true "up and down" measure.

It will be observed how much the waxing of the line increases its rate of descent.

Many of the irregularities in these tables of the Dolphin, are owing to changes in the size of the line. Lieut. Lee weighed his, and found it to vary from 100 to 114 lbs. per 10,000 fathoms.

The human mind delights in the marvellous; and there is no subject which those who cater for it are likely to seize upon with more avidity, than upon the reports which are now and then made of the enormous depths to which the plummet has descended in the deep sea, without reaching bottom. It is always desirable to prevent error from building up its edifices in the popular mind; for, when truth comes along, it has first to pull these down, and to contend with many difficulties in removing the vast amount of rubbish that falsehood may have made, before it can begin a single structure.

It seems, therefore, the proper time, now that so much has been done with the Atlantic Ocean, in the way of sounding it out, to review the great depths which have been reported from time to time.

First referring to Plate XIV. and the fifth edition of this work, there is the great wire cast of 5,700 fathoms from the Taney. This always, in my judgment, required confirmation, because of the material used. The other soundings, near the same place on the chart, render the probability of any such depth of water in that part of the ocean still more questionable.

I, therefore, in the shadings of this plate, requested Professor Flye, by whom the lines were drawn, not to regard it.

Besides this, there are the soundings of 5,200 fathoms by the Plymouth, in lat. 37° 28′ N., long. 56° 32′ W.; of 5,070 by the St. Louis, in lat. 36° 16′ N., long. 46° 52′ 15″ W.; and of 4,000 by the Jamestown, lat. 36° N., long. 27° 20′ W., all of which are reported without bottom, and all of which were

marked as doubtful from the first, owing to the evidence furnished by the official reports which were made with them to this office.

With regard to the Plymouth's sounding, no time except the total was kept. The cast was made from the vessel; and, during the operation, the wind and sea increased so much, says Captain Kelly, "that I deemed it advisable to part the line and await a more favorable opportunity, not being able to sound with any accuracy."*

In the case of the St. Louis, the sounding was made from a boat; pains were taken to keep the line up and down, but the shot was timed only by the 1,000 fathoms. And though Captain Ingraham reported bottom, the intervals, in my judgment, did not indicate such a depth, and therefore the note of interrogation was applied, expressive of that doubt.

The Jamestown simply reports no bottom; and on board that vessel, the supposition that bottom in any case had been reached, "arose from the fact that the line paying out briskly would suddenly cease, and on being hauled in would for a moment come up very heavily, and then, as though the weight of the shot had parted from it, come up easily."†

It was not supposed that the depth of the ocean could be so great, so near the Western Islands; hence the note of interrogation, which I ventured to attach to that sounding, the propriety of which Berryman's soundings seem now to confirm.

I have practically erased the last; and though I doubt the other two, yet, as they are in a part of the ocean where soundings are scarce, and where vessels frequently go, I have left them there with the hope that they would tempt some navigator to get a true sounding, and so erase them, or the mark of doubt.

With regard to the other soundings, which I had no reason, at the time they were made, to doubt, but upon which subsequent results have thrown light sufficient to cause them to be erased entirely, or seriously questioned, I may simply remark, that in this class, among others, is included Capt. Barron's sounding of 5,500 fathoms in the Jno. Adams, lat. 32° 06′ N., long. 44° 47′ W. This cast was made from the ship. The shot was timed by the 1,000 fathoms, but the officers were sure, from the feeling of the line, that bottom had been reached. Several good and accurate soundings have been since made near the same place by the Dolphin, and from a boat, which show the depth to be less than 3,000 fathoms. Hence the erasure of Barron's cast.

There is a number of other soundings, especially those very great ones which are marked with the sign of "no bottom," to which I have attached notes of doubt (?) on Plate XIV.

Though I had no reason to question their accuracy at first, yet subsequent and reliable soundings seem to show that the sea, there, is not as deep as they indicate it to be.

Since, however, the great wire sounding of Lieut. Walsh, in the Taney, was made, in 1849, and for full details of which, see the fifth edition of this work, three others, with a greater length of line out, have been made. They deserve special notice, for I think all of them are in error as to depth.

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* See Maury's Sailing Directions, page 213, 5th ed.

† Ibid.

One of these casts was of 8,300 fathoms, by Lieut. J. P. Parker, of the U. S. frigate Congress, 4th April, 1852, lat. 35° 35′ S., long. 45° 10′ W. Another, of 7,706 fathoms, by Capt. Denham, of H. M. S. Herald, 30th Oct. 1852, lat. 36° 49′ S., long. 37° 06′ W. And the other, of 6,600 fathoms, by Lieut. O. H. Berryman, commanding U. S. brig Dolphin, 12th Feb. 1853, lat. 32° 55′ N., long. 47° 58′ W.

The first two casts, it will be observed, were made within 400 miles of each other, and with the same twine; for Commodore McKeever supplied, from the stock on board the Congress, 15,000 fathoms to the Herald. The plummet used by Capt. Denham was a 9 lb. lead. It is much to be regretted that he did not use a 32 lb. shot; for, then, his line being the same, his sounding might have been compared with our own, with far greater satisfaction.

Capt. Denham's last 706 fathoms (from 7,000 to 7,706) went out at the rate of four-fifths of a mile per hour. He had a 9 lb. lead as a sinker. Now let us ask any sailor who is familiar with the resistance made by lines when towed through the water, whether, in his opinion, a force of 9 lbs. could tow eight miles length of line, three-tenths of an inch in circumference, at the rate of four-fifths of a mile the hour? Moreover, his eighth thousand fathoms went out faster than his fifth. Surely, a 9 lb. lead would not drag a line 7,000 fathoms long, and upwards, through the water faster than it would drag one out 4,000 fathoms in length.

It is probable that there is in all parts of the deep sea one or more under currents, of greater or less velocity. Nature, by her ways, indicates this; reason, with her lights, suggest it; and experiment seems to confirm it. Our experience in deep-sea soundings is now considerable; and seldom indeed has it occurred that the line has ceased going out after the shot has reached bottom. And I suppose it is the currents of the sea, coursing through their channels of circulation, that continue to take it out.

Suppose where Captain Denham sounded, there had been but one under current, and that that had a rate of only one-tenth of a mile per hour; the line, then, that his 9 lb. sinker had to tow through the water, instead of being straight was probably a curve. It may in reality have been a curve of several convolutions; for, for aught we know, there may be in the deep sea several strata of currents, as we know there often are several strata of winds, one above the other, in the atmosphere.

Parker, of the Congress, gives the time of every 500 fathoms, after the first 300 had gone out; Denham, of the Herald, is more systematic; he gives the time of every 100 fathoms, from the beginning; Berryman, of the Dolphin, on the contrary, is less so; he gives the time for every 500, for the first 1,500 fathoms, then for every 200, till he reached 2,500 fathoms; then for 400, then for 1,000, then for 100, and so on at irregular intervals, which impairs the value of his results. Denham's is the best in this respect. Now to compare them fairly, we must have them all for like intervals. I therefore compute Berryman's as far only as is necessary to make them correspond with Parker's times and intervals, arranging Denham's accordingly.

This being done, let us compare the times of the three casts together, referring them also to the average rate of descent determined by actual experiment (see pp. 146, 147), that we may see the difference of rate

at which the same line will run out, as Parker's and Denham's, to sinkers of different weights; as well as the depths at which all uniformity as to rate of descent begins to disappear.

	INTERVALS.						
	8300 fathoms. 32 lb. shot. CONGRESS.		7706 fathoms. 9 lb. lead. HERALD.		6600 fathoms. 46 lb. shot. DOLPHIN.		
	min.	sec.	min.	sec.	min.	sec.	
From 300 to 800 fathoms	8	45	14	20	12	6	
" 800 to 1300 "	11	00	18	25	12	51	
" 1300 to 1800 "	13	00	19	30	15	07	
" 1800 to 2300 "	15	00	22	00	20	07	
" 2300 to 2800 "	19	00	23	50	24	11	
" 2800 to 3300 "	37	00	28	20	25	53	
" 3300 to 3800 "	51	00	39	20	28	00	1000 fathoms.
" 3800 to 4300 "	28	00	43	40	34	00	
" 4300 to 4800 "	33	15	42	25	47	22	
" 4800 to 5300 "	34	45	47	50	52	16	
" 5300 to 5800 "	34	00	53	50	64	50	
" 5800 to 6300 "	34	30	55	05	70	32	
" 6300 to 6800 "	21	30	53	55	72	34	
" 6800 to 7300 "	27	00	52	25			
" 7300 to 7800 "	38	30	44	14			
" 7800 to 8300 "	21	00					

I do not recollect the size of the Dolphin's twine; it is evident, however, that this, as well as all other sounding-twine, requires force to pull it from the reel, and to drag it down through the depths of the ocean; that the deeper the plummet, and the greater the length of line to be dragged down, the greater the resistance, and, therefore, the slower the rate at which the line goes out.

Hence, we may deduce a rule which, as a general one, may be taken as correct, viz: that when the line ceases to go out at something like a regularly decreasing rate, there is no reliance to be put upon the sounding, after the change; and that when the rate of going out becomes uniform—or now fast, now slow—the plummet has probably ceased to drag the line down, and the force which continues to take the sounding-line out, is due to the wind, currents, heave of the sea, or drift—one, some, or all.

Let us apply this rule to these casts:—

That of the Congress fulfilled these conditions, as to a tolerably regular decreasing rate, to the 2,800 fathoms mark. The rates after that, indicate pretty clearly that, whatever might have been the agent which continued to take the line out, it was not the sinking of the 32 lb. shot. There is an appearance of

too much uniformity in the rate after that. Therefore, I infer that, when the 2,800 fathoms mark went out, the shot was probably on or near the bottom; and that, where this sounding was made, the ocean, instead of being some 8,300 fathoms deep, is not more than 3,000.

The Herald's plummet fulfilled the conditions, generally, of a decreasing rate, until the 4,300 fathoms mark went out; and after this the rate becomes of such a character as to justify the conclusion that the 9 lb. sinker used had then ceased, or nearly ceased, to descend, if it were not already on the bottom.

The care with which Captain Denham observed every 100 fathoms mark, and timed it as it went out, enables us to detect, probably, more closely in his sounding than in either of the others, the time when his plummet ceased to sink.

From 100 to 700 fathoms, each 100 fathoms mark required between two and three minutes to go out; from 700 to 1,600, each mark required between three and four minutes; from 1,600 to 2,700, each mark required between four and five minutes; from 2,700 to 3,000, each required between five and six minutes. Here the times begin to become irregular; the 3,200 and 3,300 marks, each took between six and seven minutes to go out. After this, there is no more regularity as to the increasing times. Every 100 fathoms mark thereafter appears to have a rate of its own, varying from seven to twelve minutes—but now fast, now slow—and in such a manner as to justify the inference that the ocean, where the Herald reports 7,706 fathoms, is probably not more than 4,000 fathoms deep. It was probably the wind, or some agent at the surface, that caused the irregularity as to time, after the 4,300 fathoms mark went out.

The Dolphin had the heaviest plummet, and the largest line. The time required with her for each of the first 500 fathoms marks to run out, was longer than the Congress, but shorter than the Herald. But, after the 4,300 fathoms mark of the Herald went out, then the Herald's line was the swifter; then it assumed, approximately at least, the condition of equal lengths in equal times; whereas, the Dolphin's continued to decrease its rate, and to go slower and slower, till the 6,300 fathoms mark went out. She sent down 6,600 fathoms; the interval, therefore, from 6,300 to 6,800 is computed. The inference therefore, would be that, if the weight had not reached bottom before, it ceased to go down about the time the 6,300 fathoms mark went out.

But the sounding was not made with the usual care; and, with the lights now before me, no such inference as to depth is admissible. Subsequent soundings in the vicinity give bottom at a much less depth. Lieut. Berryman informs me that, since these were made, he has no confidence whatever in that 6,300 fathoms cast. Nor have I.

By aid of the law which a careful examination of the tables, pp. 138—147, will indicate, we can tell very nearly when the ball ceased to carry the line out, and when, of course, it began to go out in obedience to the current and drift alone; for currents sweep the line out at a uniform rate, while the cannon ball drags it out at a decreasing rate.

The development of this law certainly was an achievement, for it enabled us to show that the depth of the sea at the places named (§ 157) was not as great as reports made it. These researches were interesting; the problem in hand was important, and it deserved every effort that ingenuity could suggest for reducing it to a satisfactory solution.

As yet, no specimens of the bottom had been brought up. The line was too small, the shot too heavy, and it could not be weighed. In this state of the case, Passed Midshipman J. M. Brooke, United States Navy, who, at the time, was associated with me on duty at the Observatory, proposed a contrivance by which the shot, on striking the bottom, would detach itself, and send up the line with a specimen of the bottom. This beautiful contrivance, called Brooke's Deep-sea Sounding Apparatus, is represented in Plates VII. and VIII.

A, cannon ball, having a hole through it for the rod, B. Plate VII. represents the rod, B; the slings, D D, with the shot slung, and in the act of being lowered down. Plate VIII. represents the apparatus in the act of striking the bottom, and shows how the shot is detached, and how specimens of the bottom are brought up, by adhering to a little soap or tallow,* called "arming," in the cup, C, at the lower end of the rod, B. With this contrivance specimens of the bottom have been brought up from the depth of two miles.

164. The greatest depths at which the bottom of the sea has been reached with the plummet are in the North Atlantic Ocean, and the places where it has been fathomed do not show it to be deeper than twenty-five thousand feet.

The deepest place in this ocean (Plate XIV.) is probably between the parallels of 35° and 40° north latitude, and immediately to the southward of the Grand Banks of Newfoundland. No satisfactory deep-sea soundings worth mentioning, either in the Pacific or Indian Oceans, have as yet been made by those who are co-operating in this admirable plan of research. A few have been made in the South Atlantic, but not enough to justify deduction as to its depths or the shape of its floor.

CHAPTER XI.

THE BASIN OF THE ATLANTIC.†

Height of Chimborazo above the Bottom of the Sea, § 165.—The deepest Place in the Atlantic, 166.—The Utility of Deep-sea Soundings, 167.—A Microscopic Examination of them, 168.—Brooke's Deep-sea Lead presents the Sea in a new Light, 169.—The Agents at work upon the Bottom of the Sea, 170.—How the Ocean is prevented from growing salter, 171.—Knowledge of our Planet to be derived from the Bottom of the Sea, 172.

165. The Basin of the Atlantic, according to the deep-sea soundings made in the manner described in the foregoing chapter, is shown on Plate XIV. This plate refers chiefly to that part of the Atlantic which is included within our hemisphere.

In its entire length, the basin of this sea is a long trough, separating the Old World from the New, and extending probably from pole to pole.

This ocean-furrow was scored into the solid crust of our planet by the Almighty hand, that there the

* A Stillwagen cup is found to answer better.

† *Vide* Maury's Physical Geography of the Sea.

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waters which "he called seas" might be gathered together, so as to "let the dry land appear," and fit the earth for the habitation of man.

From the top of Chimborazo to the bottom of the Atlantic, at the deepest place yet reached by the plummet in the North Atlantic, the distance, in a vertical line, is nine miles.

Could the waters of the Atlantic be drawn off, so as to expose to view this great sea-gash, which separates continents, and extends from the Arctic to the Antarctic, it would present a scene the most rugged, grand, and imposing. The very ribs of the solid earth, with the foundations of the sea, would be brought to light, and we should have presented to us at one view, in the empty cradle of the ocean, "a thousand fearful wrecks," with that dreadful array of dead men's skulls, great anchors, heaps of pearl and inestimable stones, which, in the poet's eye, lie scattered in the bottom of the sea, making it hideous with sights of ugly death.

To measure the elevation of the mountain-top above the sea, and to lay down upon our maps the mountain ranges of the earth, is regarded in geography as an important thing, and rightly so. Equally important is it, in bringing the physical geography of the sea regularly within the domains of science, to present its orology, by mapping out the bottom of the ocean so as to show the depressions of the solid parts of the earth's crust there, below the sea-level.

166. Plate XIV. presents the second attempt at such a map. It relates exclusively to the bottom of that part of the Atlantic Ocean which lies north of 10° south. It is stippled with four shades; the darkest (that which is nearest the shore-line) shows where the water is less than six thousand feet deep; the next, where it is less than twelve thousand feet; the third, where it is less than eighteen thousand; and the fourth, or lightest, where it is not over twenty-four thousand feet deep. The blank space south of Nova Scotia and the Grand Banks includes a district within which very deep water has been reported; but from casts of the deep-sea lead which, upon discussion, do not appear satisfactory.

The deepest part of the North Atlantic is probably somewhere between the Bermudas and the Grand Banks, but how deep it may be, yet remains for the cannon ball and sounding-twine to determine.

The waters of the Gulf of Mexico are held in a basin about a mile deep in the deepest part.

The Bottom of the Atlantic, or its depressions below the sea-level, are given, perhaps, on this plate, with as much accuracy as the best geographers have been enabled to show, on a map, the elevations above the sea-level of the interior either of Africa or Australia.

167. "What is to be the use of these deep-sea soundings?" is a question that often occurs; and it is as difficult to be answered in categorical terms as Franklin's question: "What is the use of a new-born babe?" Every physical fact, every expression of nature, every feature of the earth, the work of any and all of those agents which make the face of the world what it is, and as we see it, is interesting and instructive. Until we get hold of a group of physical facts, we do not know what practical bearings they may have, though right-minded men know that they contain many precious jewels, which science or the expert hand of philosophy will not fail to bring out, polished, and bright, and beautifully adapted to man's purposes. Already we are obtaining practical answers to this question as to the use of deep-sea soundings;

for, as soon as they were announced to the public, they forthwith assumed a practical bearing in the minds of men, with regard to the question of a submarine telegraph across the Atlantic.

There is, at the bottom of this sea, between Cape Race in Newfoundland and Cape Clear in Ireland, a remarkable steppe, which is already known as the telegraphic plateau. A company is now engaged with the project of a submarine telegraph across the Atlantic. It is proposed to carry the wires along this plateau, from the eastern shores of Newfoundland to the western shores of Ireland. The great circle distance between these two shore-lines is one thousand six hundred miles, and the sea along the route is probably nowhere more than ten thousand feet deep. This company, it is understood, consists of men of enterprise and wealth, who, should the inquiries that they are now making prove satisfactory, are prepared to undertake the establishment forthwith of a submarine telegraph across the Atlantic.

It was upon this plateau that Brooke's sounding apparatus (§ 162) brought up its first trophies from the bottom of the sea. These specimens Lieutenant Berryman and his officers judged to be clay; but they took the precaution to label them, carefully to preserve them, and, on their return to the United States, to send them to the proper bureau. They were divided; a part was sent for examination to Professor Ehrenberg, of Berlin, and a part to Professor Bailey, of West Point—eminent microscopists both. I have not heard from the former, but the latter, in November, 1853, thus responded.

168. "I am greatly obliged to you for the deep soundings you sent me last week, and I have looked at them with great interest. They are exactly what I have wanted to get hold of. The bottom of the ocean at the depth of *more than two miles* I hardly hoped ever to have a chance of examining; yet, thanks to Brooke's contrivance, we have it clean and free from grease, so that it can at once be put under the microscope. I was greatly delighted to find that *all* these deep soundings are filled with microscopic shells; not a particle of sand or gravel exists in them. They are chiefly made up of perfect little calcareous shells (Foraminifera), and contain, also, a small number of silicious shells (Diatomaceæ).

"It is not probable that these animals lived at the depths where these shells are found, but I rather think that they inhabit the waters near the surface; and when they die, their shells settle to the bottom. With reference to this point, I shall be very glad to examine bottles of water from various depths which were brought home by the Dolphin, and any similar materials, either 'bottom,' or water from other localities. I shall study them carefully. . . . . The results already obtained are of very great interest, and have many important bearings on geology and zoology. . . . . . .

"I hope you will induce as many as possible to collect soundings with Brooke's lead, in all parts of the world, so that we can map out the animalculæ as you have the whales. Get your whalers also to collect mud from pancake ice, &c., in the polar regions: this is always full of interesting microscopic forms."

I extract from an interesting letter, lately received from Passed Midshipman Brooke, of the North Pacific Exploring Expedition, dated U. S. ship Vincennes, Sept. 3, 1854:—

" * * * * * There has been inclosed to the Department a table of temperatures at various depths, from 100 to 500 fathoms, and two reports of experiments in deep-sea soundings. Several unsuccessful attempts to sound from the ship were made, under the direction of Captain Ringgold, but

were considered unworthy of a remark—in which opinion I coincide; for, at considerable depths, one is entirely dependent upon the times of the 100 fathoms. As a general thing, I suppose an hundred thousand fathoms would all be eventually taken from the reel by the drift of the ship. On one of those occasions, a breeze sprung up on the quarter, shooting the ship ahead in such a manner as to render the cast utterly worthless.

From our experience in the Indian Ocean and Coral Sea, I am inclined to believe that there is no depth from which specimens of the bottom may not be obtained. It will ever be a source of regret that, owing to circumstances beyond my control, we were unsuccessful in recovering the line and specimen after reaching bottom with 7,040 fathoms in the Indian Ocean. Such opportunities are rare in that locality; yet, owing to the current of 60 miles, it will be a difficult matter to determine the absolute depth. That current was not as superficial as one might at first suppose; for it was during the latter part of the operation that the boat experienced its effect, and it would seem that, had the current been superficial, the line would have given indication by tending ahead, whereas it ran *right down.* Moreover, that current was local, which adds to the probability of its depth.

The cast made in the Coral Sea was satisfactory in every respect; the arming-rod came up with its lower extremity completely coated with what appeared to be a calcareous clay of such adhesive and tenacious character as to preserve the marks of the shot, made in slipping off. In fact, we had fallen upon one of those beds which eventually present the characteristic formations of England.

I fear that the specimen delivered to the chemist of the expedition has been mislaid; but, fortunately, I have in my possession ample quantity for microscopic examination, and which will be sent to you by Lieut. Maury, of the Mississippi.

I am indebted to the politeness of Lieut. Wm. L. Maury, of the Japan Expedition, for the specimen alluded to. It came from the Coral Sea, lat. 13° S., long. 162° E., and was brought up by Brooke's sounding rod from the depth of 2,150 fathoms. I am without any further account as to the manner of making the sounding, or the time of running out. The specimen was immediately divided between the microscopes of my friends, Professors Bailey and Ehrenberg. The latter reports as follows:—

"You may be sure I was not backward in taking a look at the specimens you sent me, which, from their locality, promised to be so interesting. The sounding from 2,150 fathoms, although very small in *quantity*, is not bad in *quality*, yielding representatives of most of the great groups of microscopic organisms usually found in marine sediments.

"The predominant forms are silicious spicules of *sponges.* Various forms of these occur; some long and spindle-shaped, or acicular; others pin-headed; some three spined, &c. &c.

"The Diatoms (silicious infusoria of Ehrenberg) are very few in number, and mostly fragmentary. I found, however, some perfect valves of a coscinodiscus.

"The Foraminifera (Polythalamia of Ehrenberg) are very *rare*, only one perfect shell being seen, with a few fragments of others.

"The Polycistineæ are present, and some species of Haliomma were quite perfect. Fragments of other

forms of this group indicate that various interesting species might be obtained, if we had more of the material.

"You will see by the above, that this deep sounding differs considerably from those obtained in the Atlantic. The Atlantic soundings were almost wholly composed of calcareous shells of the Foraminifera; these, on the contrary, contain very few Foraminifera, and are of a silicious rather than a calcareous nature. This only makes the condition of things, in the Northern Atlantic, the more interesting."

And just as this sheet is going to press, I have received, in reply, the following letter from Professor Bailey:—

West Point, *February* 18, 1855.

"You ask 'Why do the silicious organisms of the Coral Sea make the calcareous ones of the Atlantic more interesting?' My idea was that they prove that deep water is not *necessarily* underlaid by foraminiferous deposits, and that some peculiar local conditions of temperature, currents, or geological substratum, have made the North Atlantic a perfect *vivarium* for the calcareous forms.

"The chart (Plate XIX.) you send is *very* interesting, and combines a wonderful amount of interesting phenomena. I have little doubt that the history of the bottom of the ocean, as recorded by the sediments, would show a close relation to the facts determined for the surface, besides many unexpected relations. I cannot conceive how any intelligent seaman can need *urging* to undertake the task of deep sounding. I feel sure that you can present the matter in a light that would be more attractive to them than I can. I am very anxious to get some soundings from the great ocean current that, as shown in your chart, sweeps *in* through the Caribbean Sea, and along the coast of Mexico and Texas.

"I observe on your chart something which looks like a sargassum sea, S. E. of Madagascar. Is it so? Get soundings, if possible, in these sargassum seas. Get soundings *anywhere—everywhere.* Even when they yield nothing, the negative fact is of value."

Here, again, we perceive these little conservators of the sea at work. This specimen comes from the coral regions, and the task of secreting the calcareous matter from the sea water appears to have been left by these little mites of creatures to the madrepores and shell-fish, though they themselves undertook the hard task of getting the silicious matter out. The division of labor among the organisms of the sea are wonderful. It is a great workshop, in which the machinery is so perfect that nothing ever goes wrong.

These little mites of shells seem to form but a slender clew indeed by which the chambers of the deep are to be threaded, and mysteries of the ocean revealed; yet the results are suggestive; in right hands and to right minds, they are guides to both light and knowledge.

The first noticeable thing the microscope gives of these specimens is, that all of them are of the animal, not one of the mineral kingdom.

The ocean teems with life, we know. Of the four elements of the old philosophers—fire, earth, air,

and water—perhaps the sea most of all abounds with living creatures. The space occupied on the surface of our planet by the different families of animals and their remains is inversely as the size of the individual. The smaller the animal, the greater the space occupied by his remains. Though not invariably the case, yet this rule, to a certain extent, is true, and will, therefore, answer our present purposes, which are simply those of illustration. Take the elephant and his remains, or a microscopic animal, and his, and compare them. The contrast, as to space occupied, is as striking as that of the coral reef or island with the dimensions of the whale. The grave-yard that would hold the corallines is larger than the grave-yard that would hold the elephants.

We notice another practical bearing in this group of physical facts, that Brooke's apparatus fished up from the bottom of the deep sea. Bailey, with his microscope (§ 168), could not detect a single particle of sand or gravel among these little mites of shells. They were from the great telegraphic plateau (§ 167), and the inference is that there, if anywhere, the waters of the sea are at rest. There was not motion enough there to abrade these very delicate organisms, nor current enough to sweep them about and mix up with them a grain of the finest sand, nor the smallest particle of gravel torn from the loose beds of debris that here and there strew the bottom of the sea. This plateau is not too deep for the wire to sink down and rest upon, yet it is not so shallow that currents, or icebergs, or any abrading force can derange the wire after it is once lodged.

As Professor Bailey remarks, the animalculæ, whose remains Brooke's lead has brought up from the bottom of the deep sea, probably did not live or die there. They would have had no light there, and, had they lived there, their frail little textures would have been subjected in their growth to a pressure upon them of a column of water twelve thousand feet high, equal to the weight of four hundred atmospheres. They probably lived and died near the surface, where they could feel the genial influences of both light and heat, and were buried in the lichen caves below, after death.

169. Brooke's lead and the microscope, therefore, it would seem, are about to teach us to regard the ocean in a new light. Its bosom, which so teems with animal life; its face, upon which time writes no wrinkles—makes no impression—are, it would now seem, as obedient to the great law of change as is any department whatever, either of the animal or the vegetable kingdom. It is now suggested that, henceforward, we should view the surface of the sea as a nursery teeming with nascent organisms, its depths as the cemetery for families of living creatures that outnumber the sands on the sea-shore for multitude.

Where there is a nursery, hard by there will be found also a grave-yard—such is the condition of the animal world. But it never occurred to us before to consider the surface of the sea as one wide nursery, its every ripple a cradle, and its bottom one vast burial-place.

170. On those parts of the solid portions of the earth's crust which are at the bottom of the atmosphere, various agents are at work, levelling both upward and downward. Heat and cold, rain and sunshine, the winds and the streams, all assisted by the forces of gravitation, are unceasingly wasting away the high places on the land and as perpetually filling up the low.

But in contemplating the levelling agencies that are at work upon the solid portions of the crust of our planet which are at the bottom of the sea, one is led, at first thought, almost to the conclusion that these levelling agents are powerless there.

In the deep sea there are no abrading processes at work; neither frosts nor rains are felt there, and the force of gravitation is so paralyzed down there that it cannot use half its power, as on the dry land, in tearing the overhanging rock from the precipice and casting it down into the valley below.

When considering the bottom of the ocean, we have, in the imagination, been disposed to regard the waters of the sea as a great cushion, placed between the air and the bottom of the ocean, to protect and defend it from these abrading agencies of the atmosphere.

The geological clock may, we thought, strike new periods; its hands may point to era after era; but, so long as the ocean remains in its basin, so long as its bottom is covered with blue water, so long must the deep furrows and strong contrasts in the solid crust below stand out bold, ragged, and grand. Nothing can fill up the hollows there; no agent now at work, that we know of, can descend into its depths, and level off the floors of the sea.

But it now seems that we forgot these oceans of animalculæ that make the surface of the sea sparkle and glow with life. They are secreting from its surface solid matter for the very purpose of filling up those cavities below. These little marine insects are building their habitations at the surface, and when they die, their remains, in vast multitudes, sink down and settle upon the bottom. They are the atoms of which mountains are formed—plains spread out. Our marl-beds, the clay in our river-bottoms, large portions of many of the great basins of the earth, are composed of the remains of just such little creatures as these, which the ingenuity of Brooke and the industry of Berryman have enabled us to fish up from the depth of more than two miles (twelve thousand feet) below the sea-level.

These *foraminiferæ*, therefore, when living, may have been preparing the ingredients for the fruitful soil of a land that some earthquake or upheaval, in ages far away in the future, may be sent to cast up from the bottom of the sea for man's use.

The study of these "sunless treasures," recovered with so much ingenuity from the rich bottom of the sea, suggests new views concerning the physical economy of the ocean.

In the chapter on the *Salts of the Sea*, I have endeavored to show how sea-shells and marine insects may, by reason of the offices which they perform, be regarded as compensations in that exquisite system of physical machinery by which the harmonies of nature are preserved.

But the treasures of the lead and revelations of the microscope present the insects of the sea in a new and still more striking light. We behold them now serving not only as compensations by which the motions of the water in its channels of circulation are regulated, and climates softened, but acting also as checks and balances by which the equipoise between the solid and the fluid matter of the earth is preserved.

Should it be established that these microscopic creatures live at the surface, and are only buried at the bottom of the sea, we may then view them as conservators of the ocean; for, in the offices which they perform, they assist to preserve its *status* by maintaining the purity of its waters.

It is admitted (§ 105) that the salts of the sea come from the land, and that they consist of the soluble matter which the rains wash out from the fields, and which the rivers bring down to the sea.

The waters of the Mississippi and the Amazon, together with all the streams and rivers of the world, both great and small, hold in solution large quantities of lime, soda, iron, and other matter. They discharge annually into the sea an amount of this soluble matter which, if precipitated and collected into one solid mass, would no doubt surprise and astonish the boldest speculator with its magnitude.

171. This soluble matter cannot be evaporated. Once in the ocean, there it must remain; and as the rivers are continually pouring in fresh supplies of it, the sea, it has been argued, must continue to become more and more salt.

Now, the rivers convey to the sea this solid matter mixed with fresh water, which, being lighter than that of the ocean, remains for a considerable time at or near the surface. Here the microscopic organisms of the deep-sea lead are continually at work, secreting this same lime and soda, &c., and extracting from the sea-water all this solid matter as fast as the rivers bring it down and empty it into the sea.

Thus we haul up from the deep-sea specimens of dead animals, and recognize in them the remains of creatures, which, though invisible to the naked eye, have nevertheless assigned to them a most important office in the physical economy of the universe, viz: that of regulating the saltness of the sea (§ 105).

This view suggests many contemplations. Among them, one, in which the ocean is presented as a vast chemical bath, in which the solid parts of the earth are washed, filtered, and precipitated again as solid matter, but in a new form, and with fresh properties.

Doubtless it is only a re-adaptation, though it may be in an improved form, of old, and perhaps effete matter, to the uses and well-being of man.

These are speculations merely; they may be fancies without foundation, but idle they are not, I am sure; for when we come to consider the agents by which the physical economy of this our earth is regulated, by which this or that result is brought about and accomplished in this beautiful system of terrestrial arrangements, we are utterly amazed at the offices which have been performed, the work which has been done, by the animalculæ of the water.

But whence come the little silicious and calcareous shells which Brooke's lead has brought up, in proof of its sounding, from the depth of over two miles? Did they live in the surface waters immediately above? or is their *habitat* in some remote part of the sea, whence, at their death, the currents were sent forth as pall-bearers, with the command to deposit their remains where the plummet found them?

172. In this view, these little organisms become doubly interesting. When dead, the descent of the shell to its final resting-place would not, it may be supposed, be very rapid. It would partake of the motion of the sea water in which it lived and died, and probably be carried along with it in its channels of circulation for many a long mile.

The microscope, under the eye of Ehrenberg, has enabled us (§ 41) to put tallies on the wings of the wind, to learn of them somewhat concerning its "circuits."

Now, may not these shells, which were so fine and impalpable that the officers of the Dolphin took

them to be a mass of unctuous clay—may not, I say, these, with other specimens of soundings yet to be collected, be all converted by the microscope into tallies for the waters of the different parts of the sea, by which the channels, through which the circulation of the ocean is carried on, are to be revealed?

Suppose, for instance, that the dwelling-place of the little shells which compose this specimen from that part of the ocean be ascertained, by referring to living types, to be the Gulf of Mexico, or some other remote region; that the *habitat* and the burial-place, in every instance, be far removed from each other—by what agency, except through that of currents, can we suppose these little creatures—themselves not having the power of locomotion—to come from the place of their birth, or to travel to that of their burial?

Man can never see—he can only touch the bottom of the deep sea, and then only with the plummet. Whatever it brings up thence is to the philosopher matter of powerful interest; for on such information alone as he may gather from a most careful examination of such matter, the amount of human knowledge concerning nearly all that portion of our planet which is covered by the sea must depend.

Every specimen of bottom from the deep sea is, therefore, to be regarded as probably containing something precious in the way of contribution to the sources of human knowledge.

CHAPTER XII.

THE CLIMATES OF THE OCEAN.*

Gulf Stream a Milky Way, § 173.—The hottest Months in the Sea, 174.—A Line of invariable Temperature, 175.—How the western half of the Atlantic is heated up, 176.—How the Cold Waters from Davis's Straits press upon the Gulf Stream, 178.—How the different Isotherms travel from North to South with the Seasons, 179.—The Polar and Equatorial Drift, 180.

173. THERMAL Charts, showing the temperature of the surface of the Atlantic Ocean by actual observations made indiscriminately all over it, and at all times of the year, have been published. The isothermal lines which these Charts enable us to draw, and some of which are traced on Plate XX., afford the navigator and the philosopher much valuable and interesting information touching the circulation of the oceanic waters, including the phenomena of the cold and warm sea currents; they also cast light upon the climatology of the sea, its hyetographic peculiarities, and the climatic conditions of various regions of the earth; they show that the profile of the coast-line of inter-tropical America assists to give expression to the mild climate of Southern Europe; they also increase our knowledge concerning the Gulf Stream, for it enables us to mark out, for the mariner's guidance, the "Milky Way" in the ocean, the waters of which teem, and sparkle, and glow with life and incipient organisms as they run across the Atlantic. In them

* *Vide* Maury's Physical Geography of the Sea. Harper and Brothers, New York.

are found the clusters and nebulæ of the sea, which stud and deck the great highway of ships on their voyage between the Old World and the New; and these lines assist to point out for the navigator their limits and his way. They show this *via lactea* to have a vibratory motion, that calls to mind the graceful wavings of a pennon as it floats gently to the breeze. Indeed, if we imagine the head of the Gulf Stream to be hemmed in by the land in the Straits of Bemini, and to be stationary there, and then liken the tail of the Stream itself to an immense pennon floating gently in the current, such a motion as such a streamer may be imagined to have—very much such a motion—do my researches show the tail of the Gulf Stream to have. Running between banks of cold water, it is pressed now from the north, now from the south, according as the great masses of sea matter on either hand may change or fluctuate in temperature.

In September, when the waters in the cold regions of the north have been tempered, and made warm and light by the heat of summer, its limits on the left (Plate XVII.) are as denoted by the line of arrows; but after this great sun-swing, the waters on the left side begin to lose their heat, grow cold, become heavy, and press the hot waters of this stream within the channel marked out for them.

Thus it acts like a pendulum, slowly propelled by heat on one side and repelled by cold on the other. In this view, it becomes the chronograph of the sea, keeping time for its inhabitants, and marking the seasons for the great whales; and there it has been for all time, vibrating to and fro, swinging from north to south and from south to north, a great self-regulating, self-compensating pendulum.

In seeking information concerning the climates of the ocean, it is well not to forget this remarkable contrast between its climatology and that of the land, viz: on the land, February and August are considered the coldest and the hottest months; but to the inhabitants of the sea, the annual extremes of cold and heat occur in the months of March and September. On the dry land, after the winter "is past and gone," the solid parts of the earth continue to receive from the sun more heat in the day than they radiate at night; consequently there is an accumulation of caloric, which continues to increase until August. The summer is now at its height; for, with the close of this month, the solid parts of the earth's crust and the atmosphere above begin to dispense with their heat faster than the rays of the sun can impart fresh supplies, and consequently the climates which they regulate grow cooler and cooler until the dead of winter again.

174. But, at sea, a different rule seems to prevail. Its waters are the storehouses in which the surplus heat of summer is stored away against the severity of winter, and they continue to grow warmer for a month after the weather on shore has begun to get cool. This brings the highest temperature to the sea in September, the lowest in March. Plate XX. is intended to show the extremes of heat and cold to which the *waters*—not the ice—of the sea are annually subjected, and therefore the isotherms of 40°, 50°, 60°, 70°, and 80° have been drawn for March and September, the months of extreme heat and extreme cold to the inhabitants of the "great deep." Corresponding isotherms for any other month will fall between these, taken by pairs. Thus the isotherm of 70° for July will fall nearly between the same isotherms (70°) for March and September.

A careful study of this plate, and the contemplation of the benign influences of the sea upon the climates which we enjoy, suggest many beautiful thoughts; for, by such study, we get a glimpse into the

arrangements and the details of that exquisite machinery in the ocean which enables it to perform all its offices, and to answer with fidelity its marvellous adaptations.

How, let us inquire, does the isotherm of 80°, for instance, get from its position in March to its position in September? Is it wafted along by currents, that is, by water which, after having been heated near the equator to 80°, then flows to the north with this temperature? Or is it carried there simply by the rays of the sun, as the snow-line is carried up the mountain in summer? We have reason to believe that it is carried from one parallel to another by each of these agents acting together, but mostly through the instrumentality of currents; for currents are the chief agents for distributing heat to the various parts of the ocean. The sun with its rays would, were it not for currents, raise the water in the torrid zone to blood heat; but, before that can be done, they run off with it to the poles, softening, and mitigating, and tempering climates by the way. The provision for this is as beautiful as it is benign; for, to answer a physical adaptation, it is provided by a law of nature that when the temperature of water is raised, it shall expand; as it expands, it must become lighter, and just in proportion as its specific gravity is altered, just in that proportion is equilibrium in the sea destroyed. Arrived at this condition, it is ordained that this hot water shall obey another law of nature, which requires it to run away, and hasten to restore that equilibrium. Were these isothermal lines moved only by the rays of the sun, they would slide up and down the ocean like so many parallels of latitude—at least there would be no breaks in them, like that which we see in the isotherm of 80° for September. It appears, from this line, that there is a part of the ocean near the equator, and about midway the Atlantic, which, with its waters, never does attain the temperature of 80° in September. Moreover, this isotherm of 80° will pass, in the North Atlantic, from its extreme southern to its extreme northern declination—nearly two thousand miles—in about three months. Thus it travels at the rate of about twenty-two miles a day. Surely, without the aid of currents, the rays of the sun could not drive it along that fast.

Being now left to the gradual process of cooling by evaporation, atmospherical contact, and radiation, it occupies the other eight or nine months of the year in slowly returning south to the parallel whence it commenced to flow northward. As it does not cool as rapidly as it was heated, the disturbance of equilibrium by alteration of specific gravity is not so sudden, nor the current which is required to restore it so rapid. Hence the slow rate of movement at which this line travels on its march south.

Between the meridians of 25° and 30° west, the isotherm of 60° in September ascends as high as the parallel of 56°. In October, it reaches the parallel of 50° north. In November, it is found between the parallels of 45° and 47°, and by December, it has nearly reached its extreme southern descent between these meridians, which it accomplishes in January, standing then near the parallel of 40°. It is all the rest of the year in returning northward to the parallel whence it commenced its flow to the south in September.

Now, it will be observed that this is the season—from September to December—immediately succeeding that in which the heat of the sun has been playing with greatest activity upon the polar ice. Its melted waters, which are thus put in motion in June, July, and August, would probably occupy the fall months

in reaching the parallels indicated. These waters, though cold, and rising gradually in temperature as they flow south, are probably fresher, and if so, probably lighter than the sea water; and, therefore, it may well be that both the warmer and cooler systems of these isothermal lines are made to vibrate up and down the ocean principally by a gentle surface current in the season of quick motion, and in the season of the slow motion principally by a gradual process of calorific absorption on the one hand, and by a gradual process of cooling on the other.

We have precisely such phenomena exhibited by the waters of the Chesapeake Bay as they spread themselves over the sea in winter. At this season of the year, the Charts show that water of very low temperature is found projecting out and overlapping the usual limits of the Gulf Stream. The outer edge of this cold water, though jagged, is circular in its shape, having its centre near the mouth of the bay. The waters of the bay, being fresher than those of the sea, may, therefore, though colder, be lighter than the warmer waters of the ocean. And thus we have repeated here, though on a smaller scale, the phenomenon as to the flow of cold waters from the north, which force the surface isotherm of 60° from latitude 56° to 40° during three or four months.

Changes in the color or depth of the water, and the shape of the bottom, &c., would also cause changes in the temperature of certain parts of the ocean, by increasing or diminishing the capacities of such parts to absorb or radiate heat; and this, to some extent, would cause a bending, or produce irregular curves in the isothermal lines.

After a careful study of this plate, and the Thermal Charts of the Atlantic Ocean, from which the materials for this plate were derived, I am led to infer that the mean temperature of the atmosphere between the parallels of 56° and 40° north, for instance, and over that part of the ocean in which we have been considering the fluctuations of the isothermal line of 60°, is at least 60° of Fahrenheit, and upward, from January to August, and that the heat which the waters of the ocean derive from this source—atmospherical contact and radiation—is one of the causes which move the isotherm of 60° from its January to its September parallel.

It is well to consider another of the causes which are at work upon the currents in this part of the ocean, and which tend to give the rapid southwardly motion to the isotherm of 60°. We know the mean dew-point must always be below the mean temperature of any given place, and that, consequently, as a general rule, at sea the mean dew-point due the isotherm of 60° is higher than the mean dew-point along the isotherm of 50°, and this, again, higher than that of 40°—this than 30°, and so on. Now suppose, merely for the sake of illustration, that the mean dew-point for each isotherm be 5° lower than the mean temperature, we should then have the atmosphere which crosses the isotherm of 60°, with a mean dew-point of 55°, gradually precipitating its vapors until it reaches the isotherm of 50°, with a mean dew-point of 45°; by which difference of dew-point the total amount of precipitation over the entire zone between the isotherms of 60° and 50° has exceeded the total amount of evaporation from the same surface. The prevailing direction of the winds to the north of the fortieth parallel of north latitude is from the southward and westward (Plate XVIII.); in other words, it is from the higher to the lower isotherms. Passing, therefore, from a higher to a lower temperature over the ocean, the total amount of vapor deposited by any

given volume of atmosphere, as it is blown from the vicinity of the tropical toward that of the polar regions, is greater than that which is taken up again.

The area comprehended on Plate XVIII. between the isotherms 40° and 50° Fahrenheit is less than the area comprehended between the isotherms 50° and 60°, and this, again, less than the area between this last and 70°, for the same reason that the area between the parallels of latitude 50° and 60° is less than the area between the parallels of latitude 40° and 50°; therefore, more rain to the square inch ought to fall upon the ocean between the colder isotherms of 10° difference, than between the warmer isotherms of the same difference. This is an interesting and an important view, therefore let me make myself clear: the aqueous isotherm of 50°, in its extreme northern reach, touches the parallel of 60° north. Now, between this and the equator, there are but three isotherms, 60°, 70°, and 80°, with the common difference of 10°. But between the isotherm of 40° and the pole, there are at least five others, viz: 40°, 30°, 20°, 10°, 0°, with a common difference of 10°. Thus, to the north of the isotherm 50°, the vapor which would saturate the atmosphere from zero, and perhaps far below, to near 40°, is deposited, while to the south of 50°, the vapor which would saturate it from the temperature of 50° up to that of 80° can only be deposited. At least, such would be the case if there were no irregularities of heated plains, mountain ranges, land, &c., to disturb the laws of atmospherical circulation as they apply to the ocean.

Having therefore, theoretically, at sea more rain in high latitudes, we should have more clouds; and therefore it would require a longer time for the sun, with his feeble rays, to raise the temperature of the cold water, which, from September to January, has brought the isotherm of 60° from latitude 56° to 40°, than it did for these cool surface currents to float it down. After this southward motion of the isotherm of 60° has been checked in December by the cold, and after the sources of the current which brought it down have been bound in fetters of ice, it pauses in the long nights of the northern winter, and scarcely commences its return till the sun recrosses the equator, and increases its power as well in intensity as in duration.

Thus, in studying the physical geography of the sea, we have the effects of night and day, of clouds and sunshine, upon its currents and its climates, beautifully developed. These effects are modified by the operations of certain powerful agents which reside upon the land; nevertheless, feeble though those of the former class may be, a close study of this plate will indicate that they surely exist.

175. Now, returning toward the south: we may, on the other hand, infer that the mean atmospherical temperature for the parallels between which the isotherm of 80° fluctuates is below 80°, at least for the nine months of its slow motion. This vibratory motion suggests the idea that there is, probably, somewhere between the isotherm of 80° in August and the isotherm of 60° in January, a line or belt of invariable or nearly invariable temperature, which extends on the surface of the ocean from one side of the Atlantic to the other. This line or band may have its cycles also, but they are probably of long and uncertain periods.

176. The fact has been pretty clearly established by the discoveries to which the Wind and Current Charts have led, that the western half of the Atlantic Ocean is heated up, not by the Gulf Stream alone, as is generally supposed, but by the great equatorial caldron to the west of longitude 35°, and to the north

of Cape St. Roque, in Brazil. The lowest reach of the 80° isotherm for September—if we except the remarkable equatorial flexure (Plate XX.) which actually extends from 40° north to the line—to the west of the meridian of Cape St. Roque, is above its highest reach to the east of that meridian. And now that we have the fact, how obvious, beautiful, and striking is the cause!

Cape St. Roque is in 5° south. Now study the configuration of the Southern American Continent from this cape to the Windward Islands of the West Indies, and take into account certain physical conditions of these regions: the Amazon, always at a high temperature, because it runs from west to east, is pouring an immense volume of warm water into this part of the ocean. As this water and the heat of the sun raise the temperature of the ocean along the equatorial sea-front of this coast, there is no escape for the liquid element, as it grows warmer and lighter, except to the north. The land on the south prevents the tepid waters from spreading out in that direction as they do to the east of 35° west, for here there is a space, about 18 degrees of longitude broad, in which the sea is clear both to the north and south. They must consequently flow north. A mere inspection of the plate is sufficient to make obvious the fact that the warm waters which are found east of the usual limits assigned the Gulf Stream, and between the parallels of 30° and 40° north, do not come from the Gulf Stream, but from this great equatorial caldron, which Cape St. Roque blocks up on the south, and which forces its overheated waters up to the fortieth degree of north latitude, not through the Caribbean Sea and Gulf Stream, but over the broad surface of the left bosom of the Atlantic Ocean.

Here we are again tempted to pause and admire the beautiful revelations which, in the benign system of terrestrial adaptation, these researches into the physics of the sea unfold and spread out before us for contemplation. In doing this, we shall have a free pardon from those at least who delight "to look through nature up to nature's God."

What two things in nature can be apparently more remote in their physical relations to each other, than the climate of Western Europe and the profile of a coast-line in South America? Yet this plate not only reveals to us the fact that these relations between the two are the most intimate, but makes us acquainted with the arrangements by which such relations are established.

177. The barrier which the South American shore-line opposes to the escape, on the south, of the hot waters from this great equatorial caldron of St. Roque, causes them to flow north, and in September, as the winter approaches, to heat up the western half of the Atlantic Ocean, and to cover it with a mantle of warmth above summer heat, as far up as the parallel of 40°. Here heat, to temper the winter climate of Western Europe, is stored away as in an air-chamber for furnace-heated apartments; and during the winter, when the fire of the solar rays sinks down, the westwardly winds and eastwardly currents are sent to perform their office in this benign arrangement. Though unstable and capricious to us they seem to be, they nevertheless "fulfil His commandments" with regularity and perform their offices with certainty. In tempering the climates of Europe with heat, in winter, that has been bottled away in the waters of the ocean, during summer, they are to be regarded as the flues and the regulators for distributing at the right time, and at the right places, in the right quantities.

By March, when "the winter is past and gone," the furnace which had been started by the rays of the sun in the previous summer, and which, by autumn, had heated up the ocean in our hemisphere, has gone down. The caldron of St. Roque, ceasing in activity, has failed in its supplies, and the chambers of warmth upon the northern sea, having been exhausted of their heated water, which has been expended in the manner already explained, have contracted their limits. The surface of heated water which, in September, was spread out over the western half of the Atlantic, from the equator to the parallel of 40° north, and which raised this immense area to the temperature of 80° and upward, is not to be found in early spring on this side of the parallel of 8° north.

The isotherm of 80° in March, after quitting the Caribbean Sea, runs parallel with the South American coast toward Cape St. Roque, keeping some 8 or 10 degrees from it. Therefore the heat dispensed over Europe from this caldron falls off in March. But, at this season, the sun comes forth with fresh supplies; he then crosses the line and passes over into the northern hemisphere; observations show that the process of heating the water in this great caldron for the next winter is now about to commence.

In the mean time, so benign is the system of cosmical arrangements, another process of raising the temperature of Europe commences. The land is more readily impressed than the sea by the heat of the solar rays; at this season, then, the summer climate due these transatlantic latitudes is modified by the action of the sun's rays directly upon the land. The land receives heat from them, but, instead of having the capacity of water for retaining it, it imparts it straightway to the air; and thus the proper climate, because it is the climate which the Creator has, for his own wise purposes, allotted to this portion of the earth, is maintained until the marine caldron of Cape St. Roque is again heated and brought into the state for supplying the means of maintaining the needful temperature in Europe during the absence of the sun in the other hemisphere.

In like manner, the Gulf of Guinea forms a caldron and a furnace, and spreads out over the South Atlantic an air-chamber for heating up in winter and keeping warm the extra-tropical regions of South America. Every traveller has remarked upon the mild climate of Patagonia and the Falkland Islands.

"Temperature in high southern latitudes," says a very close observer, who is co-operating with me in collecting materials, "differs greatly from the temperature in northern. In southern latitudes, there seem to be no extremes of heat and cold, as at the north. Newport, R. I., for instance, latitude 41° north, longitude 71° west, and Rio Negro, latitude 41° south, and longitude 63° west, as a comparison: in the former, cattle have to be stabled and fed during the winter, not being able to get a living in the fields on account of snow and ice. In the latter, the cattle feed in the fields all winter, there being plenty of vegetation and no use of hay. On the Falkland Islands (latitude 51–2° south), thousands of bullocks, sheep, and horses are running wild over the country, gathering a living all through the winter."

The water in the equatorial caldron of Guinea cannot escape north—the shore-line will not permit it. It must, therefore, overflow to the south, as that of St. Roque does to the north, carrying to Patagonia and the Falkland Islands, beyond 50° south, the winter climate of Charleston, South Carolina, on our side of the North Atlantic, or of the "Emerald Island" on the other.

All geographers have noticed, and philosophers have frequently remarked upon the conformity, as to the shore-line-profile of equatorial America and equatorial Africa.

It is true, we cannot now tell the reason, though explanations founded upon mere conjecture have been offered, why there should be this sort of jutting in and jutting out of the shore-line, as at Cape St. Roque and the Gulf of Guinea, on opposite sides of the Atlantic; but one of the purposes, at least, which this peculiar configuration was intended to subserve, is without doubt now revealed to us.

We see that, by this configuration, two cisterns of hot water are formed in this ocean; one of which distributes heat and warmth to western Europe; the other, at the opposite season, tempers the climate of Eastern Patagonia.

Phlegmatic must be the mind that is not impressed with ideas of grandeur and simplicity as it contemplates that exquisite design, those benign and beautiful arrangements, by which the climate of one hemisphere is made to depend upon the curve of that line against which the sea is made to dash its waves in the other. Impressed with the perfection of terrestrial adaptations, he who studies the economy of the great cosmical arrangements, is reminded that not only is there design in giving shore-lines their profile, the land and the water their proportions, and in placing the desert and the pool where they are, but the conviction is forced upon him also, that every hill and valley, with the grass upon its sides, has each its office to perform in the grand design.

March is, in the southern hemisphere, the first month of autumn, as September is with us; consequently, we should expect to find in the South Atlantic as large an area of water of 80° and upward in March, as we should find in the North Atlantic for September. But do we? By no means. The area on this side of the equator is nearly double that on the other.

Thus we have the sea as a witness to the fact that the winds had proclaimed, viz: that summer in the northern hemisphere is hotter than summer in the southern, for the rays of the sun raise on this side of the equator double the quantity of sea surface to a given temperature that they do on the other side; at least this is the case in the Atlantic. Perhaps the breadth of the Pacific Ocean, the absence of large islands in the temperate regions north, the presence of New Holland with Polynesia in the South Pacific, may make a difference there. But of this I cannot now speak, for the thermal charts of that ocean have not yet been prepared.

178. Pursuing the study of the climates of the sea, let us now turn to Plate XIX. Here we see at a glance how the cold waters, as they come down from the Arctic Ocean through Davis's Straits, press upon the warm waters of the Gulf Stream, and curve their channel into a horseshoe. Navigators have often been struck with the great and sudden changes in the temperature of the waters hereabouts. In the course of a single day's sail, in this part of the ocean, changes of 15°, or 20°, and even of 30°, have been observed to take place in the temperature of the sea. The cause has puzzled navigators long, but how obvious is it not now made to appear! This "bend" is the great receptacle of the icebergs which drift down from the north; covering frequently an area of hundreds of miles in extent, its waters differ as much as 20°, 25°, and in rare cases even as much as 30° of temperature from those about it. Its shape and

place are variable. Sometimes it is like a peninsula, or tongue of cold water projected far down into the waters of the Gulf Stream. Sometimes the meridian upon which it is inserted into these is to the east of 40°, sometimes to the west of 50° longitude. By its discovery we have clearly unmasked the very seat of that agent which produces the Newfoundland fogs. It is spread out over an area frequently embracing several thousand square miles in extent, covered with cold water, and surrounded on three sides, at least, with an immense body of warm. May it not be that the proximity to each other of these two very unequally heated surfaces, out upon the ocean, would be attended by atmospherical phenomena not unlike those of the land and sea breezes? These warm currents of the sea are powerful meteorological agents. I have been enabled to trace, in thunder and lightning, the influence of the Gulf Stream in the eastern half of the Atlantic, as far north as the parallel of 55° north; for there, in the dead of winter, a thunder-storm is not unusual.

179. These isothermal lines of 50°, 60°, 70°, 80°, &c., may illustrate for us the manner in which the climates in the ocean are regulated. Like the sun in the ecliptic, they travel up and down the sea in declination, and serve the monsters of the deep for signs and for seasons.

180. It should be borne in mind that the lines of separation, as drawn on Plate XIX., between the cool and warm waters, or, more properly speaking, between the channels representing the great polar and equatorial flux and reflux, are not so sharp in nature as this plate would represent them. In the first place, the plate represents the mean or average limits of these constant flows—polar and equatorial; whereas, with almost every wind that blows, and at every change of season, the line of meeting between their waters is shifted. In the next place, this line of meeting is drawn with a free hand on the plate, as if to represent an average; whereas there is reason to believe that this line in nature is variable and unstable as to position, and as to shape rough and jagged, and oftentimes deeply articulated. In the sea, the line of meeting between waters of different temperatures and density is not unlike the sutures of the skull-bone on a grand scale—very rough and jagged; but, on the plate, it is a line drawn with a free hand, for the purpose of showing the general direction and position of the channels in the sea, through which its great polar and equatorial circulation is carried on.

Now, continuing for a moment our examination of Plate XX., we are struck with the fact that most of the thermal lines there drawn run from the western side of the Atlantic toward the eastern, in a northeastwardly direction, and that, as they approach the shores of this ocean on the east, they again turn down for lower latitudes and warmer climates. This feature in them indicates, more surely than any direct observations upon the currents can do, the presence, along the African shores in the North Atlantic, of a large volume of cooler waters. These are the waters which, having been first heated up in the caldron (§ 176) of St. Roque, in the Caribbean Sea, and Gulf of Mexico, have been made to run to the north, charged with heat and electricity to temper and regulate climates there. Having performed their offices, they have cooled down; but, obedient still to the "Mighty Voice" which the winds and the waves obey, they now return by this channel, along the African shore, to be again replenished with warmth, and to keep up the system of beneficent and wholesome circulation designed for the ocean.

CHAPTER XIII.

THE DRIFT OF THE SEA.*

Plate XIX., § 181.—The Polar Drift about Cape Horn, 182.—How the Polar Waters in the South Atlantic force the Equatorial aside, 183.—A Harbor for Icebergs, 184.—Why Icebergs are not found in the North Pacific, 185.—Drift of Warm Waters out of the Indian Ocean, 186.—The opinion of Lieutenant Jansen, of the Dutch Navy, 187.—A Current of Warm Water sixteen hundred miles wide, 188.—The Pulse of the Sea, 189.—The Circulation of the Sea like that of the Blood, 190.—Number of Vessels engaged in the Fisheries of the Sea, 191.—The Sperm Whale, 192.—The Torrid Zone impassable to the Right Whale, 193.

181. I HAVE spoken about currents; but there is a movement of the waters of the ocean which, though it be a translation, yet does not amount to what is known to the mariner as current, for our nautical instruments and the art of navigation have not been brought to that state of perfection which will enable navigators generally to detect as currents the flow to which I allude as *drift*. It arises from changes in the specific gravity of sea water, caused chiefly by the effects of heat. If water, from any cause, commence to flow from the equator towards the poles, it must grow cool by the way; by growing cool, it changes its specific gravity, and when its specific gravity is changed, it cannot any longer be considered as the same mass, for it does not occupy the same space it did before. The great thermal agent of the universe, therefore, is continually disturbing the equilibrium of the sea, and setting its waters in motion by expanding them with heat in the torrid, and contracting them with cold in the frigid zone; consequently, there is a general movement going on to and fro in the sea, in obedience to the forces of heat, which nothing can interrupt. Storms may override, but they cannot arrest this flow. The disturbance created in this mighty and ceaseless flow and ebb, by the agents which produce other currents, is like the eddy which follows in the wake of the steamboat on the Mississippi; it never interferes with the march of the stream in its onward flow.

If we imagine an object to be set adrift in the ocean at the equator, and if we suppose that it be of such a nature that it would obey only the influence of sea water, and not of the winds, this object, I imagine, would, in the course of time, find its way to the icy barriers about the poles, and again back among the tepid waters of the tropics. Such an object would illustrate the *drift of the sea*, and by its course would indicate the route which the surface waters of the sea follow in their general channels of circulation to and fro between the equator and the poles.

Accordingly, the object of Plate XIX. is to illustrate, as far as the present state of my researches enables me to do, this normal circulation of the ocean, as influenced by *heat* and *cold*, and to indicate the routes by which the overheated waters of the torrid zone escape to cooler regions, on one hand, and on the

* *Vide* Maury's Physical Geography of the Sea.

other, the great channel ways through which the same waters, after having been deprived of this heat in the extra-tropical or polar regions, return again toward the equator; it being assumed that the drift or flow is from the poles when the temperature of the surface water is *below*, and from the equatorial regions when it is above that due the latitude. Therefore, in a mere diagram, as this plate is, the numerous eddies and local currents which are found at sea are disregarded.

Of all the currents in the sea, the Gulf Stream is the best defined; its limits, especially those of the left bank, are always well marked, and, as a rule, those of the right bank, as high as the parallel of the thirty-fifth degree of latitude, are quite distinct, being often visible to the eye. The Gulf Stream shifts its channel (§ 143), but nevertheless its banks are often very distinct. As I write these remarks, the abstract log of the ship Herculean (William M. Chamberlain), from Callao to Hampton Roads, in May, 1854, is received. On the eleventh of that month, being in latitude 33° 39′ north, longitude 74° 56′ west (about one hundred and thirty miles east of Cape Fear), he remarks:—

"Moderate breezes, smooth sea, and fine weather. At ten o'clock fifty minutes, entered into the southern (right) edge of the Stream, and in eight minutes the water rose six degrees; the edge of the stream was visible, as far as the eye could see, by the great rippling and large quantities of gulf weed—more 'weed' than I ever saw before, and I have been many times along this route in the last twenty years."

In this diagram, therefore, I have thought it useless to attempt a delineation of any of those currents, as the Rennell Current of the North Atlantic, the "Connecting Current" of the South Atlantic, "Mentor's Counter Drift," Rossel's Drift of the South Pacific, &c., which run now this way, now that, and which are frequently not felt by navigators at all.

In overhauling the log-books for data for this Chart, I have followed vessels with the water thermometer to and fro across the seas, and taken the registrations of it exclusively for my guide, without regard to the reported set of the currents. When, in any latitude, the temperature of the water has appeared too high or too low for that latitude, the inference has been that such water was warmed or cooled, as the case may be, in other latitudes, and that it has been conveyed to the place where found, through the great channels of circulation in the ocean (§ 181). If too warm, it is supposed that it had its temperature raised in warmer latitudes, and therefore the channel in which it is found leads from the equatorial regions. On the other hand, if the water be too cool for the latitude, then the inference is that it has lost its heat in colder climates, and therefore is found in channels which lead from the polar regions.

The arrow-beards point to the direction in which the waters are supposed to flow. Their rate, according to the best information that I have obtained, is, at a mean, only about four knots a day—rather less than more.

182. Accordingly, therefore, as the immense volume of water in the Antarctic regions is cooled down, it commences to flow north. As indicated by the arrow-heads, it strikes against Cape Horn, and is divided by the continent, one portion going along the west coast as Humboldt's Current (§ 119); the other, entering the South Atlantic, flows up into the Gulf of Guinea, on the coast of Africa. Now, as the waters

of this polar flow approach the torrid zone, they grow warmer and warmer, and finally themselves become tropical in their temperature. They do not then, it may be supposed, stop their flow; on the contrary, they keep moving, for the very cause which brought them from the extra-tropical regions now operates to send them back. This cause is to be found in the difference of the specific gravity at the two places. If, for instance, these waters, when they commence their flow from the hyperborean regions, were at 30°, their specific gravity will correspond to that of sea water at 30°. But when they arrive in the Gulf of Guinea or the Bay of Panama, having risen by the way to 80°, or perhaps 85°, their specific gravity becomes such as is due sea water of this temperature; and, since fluids differing in specific gravity can no more balance each other on the same level than can unequal weights in opposite scales, this hot water must now return to restore that equilibrium which it has destroyed, in the sea, by rising from 30° to 80° or 85°.

Hence it will be perceived that these masses of water which are marked as cold are not always cold. They gradually pass into warm; for, in travelling from the poles to the equator, they partake of the temperature of the latitudes through which they flow, and grow warm.

183. Plate XIX., therefore, is only introduced to give general ideas; nevertheless, it is very instructive. See how the influx of cold water into the South Atlantic appears to divide the warm water, and squeeze it out at the sides, along the coasts of South Africa and Brazil. So, too, in the North Indian Ocean, the cold water again compelling the warm to escape along the land at the sides, as well as occasionally in the middle.

In the North Atlantic and North Pacific, on the contrary, the warm water appears to divide the cold, and to squeeze it out along the land at the sides. The impression made by the cold current from Baffin's Bay, upon the Gulf Stream, is strikingly beautiful.

Why is it that these polar and equatorial waters should appear now to divide and now to be divided? The Gulf Stream has revealed to us a fact in which the answer is partly involved. We learn from that stream that cold and warm sea waters are, in a measure (§ 143), like oil and vinegar; that is, there is among the particles of sea water at high temperatures and velocities, and among the particles of sea water at a low temperature, a peculiar molecular arrangement that is antagonistic to the free mixing up of cold and hot together. At any rate, that salt waters of different temperatures do not readily intermingle at sea, is obvious.

Does not this same repugnance exist, at least in degree, between these bodies of cold and warm water of the plate? And if so, does not the phenomenon we are considering resolve itself into a question of masses or momentum? The volume of warm water in the North Atlantic is greater than the volume of cold water that meets and opposes it; consequently, the warm thrusts the cold aside, dividing and compelling it *to go round.* The same thing is repeated in the North Pacific, whereas the converse obtains in the South Atlantic. Here the great polar flow, after having been divided by the American continent, enters the Atlantic, and, filling up nearly the whole of the immense space between South America and

Africa, seems to press the warm waters of the tropics aside, compelling them to drift along the coast on either hand.

184. Another feature of the sea, expressed by this plate, is a sort of reflection or recast of the shore-line in the temperature of the water. This feature is particularly striking in the North Pacific and Indian Ocean. Since this plate was finished, I have discovered the same phenomenon in the Gulf Stream. There is a slight bending of its northern edge as it passes the Nantucket Shoals, then there is a curve upwards to indicate the Bay of Fundy. Again, a bending to the south as it passes Nova Scotia, and then a curve upwards answering to the St. Lawrence, and then another sharp turn southward to avoid the Grand Banks, after which its northern edge shoots off to the N. E., for the Faroe Islands. The curves representing the mean limits of this edge for 60° in September, and 50° in March, being traced off with a free hand, conform to each other and with the shore-line in the most beautiful and striking manner.

It seems curious that the icebergs should all make for this great bend off the Grand Banks, where the Gulf Stream turns sharply to the N. E. The prevailing winds are westwardly, and would, were there no counteracting force, drive the ice to the east. The Gulf Stream would help them. But the forces of diurnal rotation which are obeyed by the trade-winds, and which are felt by the drift wood of the Mississippi, are present here also to press the iceberg west and force it down into this Great Bend. The peninsula of cold water of which I have so often spoken is in this bend. But let us return to the problems of Plate XIX.: The remarkable intrusion of the cool into the volume of warm waters to the southward of the Aleutian Islands, is not unlike that which the cool waters from Davis's Straits make in the Atlantic upon the Gulf Stream. As I write, I receive from Captain N. B. Grant the abstract log of the American ship Lady Arbella, bound from Hamburg to New York, in May, 1854. In sailing through this "horseshoe," or bend in the Gulf Stream (§ 178), he passed, from daylight to noon, twenty-four large "bergs," besides several small ones, "the whole ocean, as far as the eye could reach, being literally covered with them." "I should," he continues, "judge the average height of them above the surface of the sea to be about sixty feet; some five or six of them were at least twice that height, and, with their frozen peaks jutting up in the most fantastic shapes, presented a truly sublime spectacle."

185. This "horseshoe" of cold in the warm water of the North Pacific, though extending five degrees farther toward the south, cannot be the harbor for such icebergs. The cradle of those of the Atlantic was perhaps in the Frozen Ocean, for they may have come thence through Baffin's Bay. But, in the Pacific, there is no nursery for them. The water in Behring's Strait is too shallow to let them pass from that ocean into the Pacific, and the climates of Russian America do not favor the formation of large bergs. But, though we do not find in the North Pacific the physical conditions which generate icebergs like those of the Atlantic, we find them as abundant with fogs. The line of separation between the warm and cold water assures us of these conditions.

What beautiful, grand, and benign ideas do we see expressed in that immense body of warm waters which are gathered together in the middle of the Pacific and Indian Oceans! It is the womb of the sea. In it, coral islands innumerable have been fashioned, and pearls formed in "great heaps;" there,

multitudes of living things, countless in numbers and infinite in variety, are hourly conceived. With space enough to hold the four continents and to spare, its tepid waters teem with nascent organisms. "It is the realm of reef-building corals, and of the wondrously beautiful assemblage of animals, vertebrate and invertebrate, that live among them or prey upon them. The brightest and most definite arrangements of color are here displayed. It is the seat of maximum development of the majority of marine genera. It has but few relations of identity with other provinces. The Red Sea and Persian Gulf are its offsets."* They sometimes swarm so thickly there that they change the color of the sea, making it crimson, brown, black, or white, according to their own hues. These patches of colored water sometimes extend, especially in the Indian Ocean, as far as the eye can reach. The question, "What produces them?" is one that has elicited much discussion in seafaring circles. The Brussels Conference deemed them an object worthy of attention, and recommended special observations with regard to them.

The discolorations of which I speak are no doubt caused by organisms of the sea; but whether wholly animal or wholly vegetable, or whether sometimes the one and sometimes the other, has not been satisfactorily ascertained. I have had specimens of the coloring matter sent to me from the pink-stained patches of the sea. They were animalculæ well defined. Quantities of slimy, red coloring matter are, at certain seasons of the year, washed up along the shores of the Red Sea, which Dr. Ehrenberg, after an examination under the microscope, pronounces to be a very delicate kind of sea-weed: from this matter that sea derives its name. So also the Yellow Sea. Along the coasts of China, yellowish-colored spots are said not to be uncommon. I know of no examination of this coloring matter, however. In the Pacific Ocean, I have often observed these discolorations of the sea. Red patches of water are most frequently met with, but I have also observed white or milky appearances, which at night I have known greatly to alarm navigators, they taking them for shoals.

Capt. W. E. Kingman, of the American clipper ship the Shooting Star, came across a remarkable white patch in lat. 8° 46′ S., long. 105° 30′ E., and which, in a letter to me, he thus describes:—

"*Thursday*, July 27, 1854.—At 7h. 45m. P. M., my attention was called to notice the color of the water, which was rapidly growing white; knowing that we were in a much frequented part of the ocean, and having never heard of such an appearance being observed before in this vicinity, I could not account for it; I immediately hove the ship to and cast the lead; had no bottom at sixty fathoms; I then kept on our course, tried the water by thermometer, and found it to be 78½°, the same as at 8 A. M. We filled a tub, containing some 60 gallons, with the water, and found that it was filled with small luminous particles, which, when stirred, presented a most remarkable appearance; the whole tub seemed to be alive with worms and insects, and looked like a grand display of rockets and serpents, seen at a great distance in a dark night; some of the serpents appeared to be six inches in length, and very luminous; we caught, and could feel them in our hands; and they would emit light until brought within a few feet of a lamp,

* From Professor Forbes's paper on the "Distribution of Marine Life." Plate 31, Johnston's Physical Atlas, 2d ed. Wm. Blackwood and Sons, Edinburgh and London, 1854.

when, upon looking to see what we had, behold nothing was visible; but, by the aid of a Sextant's magnifier, we could plainly see a jelly-like substance without color; at last, a specimen was obtained of about two inches in length, and plainly visible to the naked eye; it was about the size of a large hair, and tapered at the ends; by bringing one end within about one-fourth of an inch of a lighted lamp, the flame was attracted towards it, and burned with a red light; the substance crisped in burning something like a hair, or appeared of a red heat before being consumed. In a glass of the water, there were several small, round substances (say $\frac{1}{16}$ of an inch in diameter), which had the power of expanding to more than twice their ordinary size, and then contracting again; when expanded, the outer rim appeared like a circular saw, only that the teeth pointed towards the centre.

"This patch of white water was about twenty-three miles in length, north and south, divided near its centre by an irregular strip of dark water half a mile wide; its east and west extent I can say nothing about.

"I have seen what is called white water in about all the known oceans and seas in the world, but nothing that would compare with this in extent or whiteness. Although we were going at the rate of nine knots, the ship made no noise either at the bow or stern; the whole appearance of the ocean was like a plain covered with snow; there was scarce a cloud in the heavens, yet the sky, for about ten degrees above the horizon, appeared as black as if a storm was raging; the stars of the first magnitude shone with a feeble light, and the "milky way" of the heavens was almost entirely eclipsed by that through which we were sailing. The scene was one of awful grandeur, the sea having turned to phosphorus, and the heavens being hung in blackness, and the stars going out, seemed to indicate that all nature was preparing for that last grand conflagration which we are taught to believe is to annihilate this material world.

"After passing through the patch, we noticed that the sky, for four or five degrees above the horizon, was considerably illuminated, something like a faint aurora borealis; we soon passed out of sight of the whole concern, and had a fine night, without any conflagration (except of midnight oil in trying to find out what was in the water). I send you this, because I believe you request your corps of "one thousand assistants" to furnish you with all such items, and I trust it will be acceptable: but, as for its furnishing you with much, if any information relative to the insects or animals that inhabit the mighty deep, time will only tell; I cannot think it will."

These teeming waters bear off through their several channels the surplus heat of the tropics, and disperse it among the icebergs of the Antarctic. See the immense equatorial flow to the east of New Holland. It is bound for the icy barriers of that unknown sea, there to temper climates, grow cool, and return again, refreshing man and beast by the way, either as the Humboldt Current, or the ice-bearing current which enters the Atlantic around Cape Horn, and changes into warm again as it enters the Gulf of Guinea. It was owing to this great southern flow from the coral regions that Captain Ross was enabled to penetrate so much further south than Captain Wilkes, on his voyage to the Antarctic, and it is upon these waters that that sea is to be penetrated, if ever. The North Pacific, except in the narrow passage between Asia and America, is closed to the escape of these warm waters into the Arctic Ocean. The only outlet for them is

to the south. They go down toward the Antarctic regions to dispense their heat and get cool; and the cold of the Antarctic, therefore, it may be inferred, is not so bitter as is the extreme cold of the Frozen Ocean of the north.

186. The warm flow to the south from the middle of the Indian Ocean is remarkable. Masters who return their abstract logs to me mention sea-weed, which I suppose to be brought down by this current, as far as 45° south. There it is generally, but not always, about five degrees warmer than the ocean along the same parallel on either side.

187. But the most unexpected discovery of all is that of the warm flow along the west coast of South Africa, its junction with the Lagullas current, called, higher up, the Mozambique, and then their starting off as one stream to the southward. The prevalent opinion used to be that the Lagullas current, which has its genesis in the Red Sea (§ 144), doubled the Cape of Good Hope, and then joined the great equatorial current of the Atlantic to feed the Gulf Stream. But my excellent friend, Lieutenant Marin Jansen, of the Dutch Navy, suggested to me, a few months ago, that this was probably not the case. This induced a special investigation, and I found as he suggested, and as is represented on Plate XIX. Captain N. B. Grant, in the admirably well-kept abstract log of his voyage from New York to Australia, found this current remarkably developed. He was astonished at the temperature of its waters, and did not know how to account for such a body of warm water in such a place. Being in longitude 14° east and latitude 39° south, he thus writes in his abstract log:—

"That there is a current setting to the eastward across the South Atlantic and Indian Oceans is, I believe, admitted by all navigators. The prevailing westerly winds seem to offer a sufficient reason for the existence of such a current, and the almost constant southwest swell would naturally give it a northerly direction. But why the water should be *warmer* here (38° 40′ south) than between the parallels of 35° and 37° south is a problem that, in my mind, admits not of so easy solution, especially if my suspicions are true in regard to the northerly set. I shall look with much interest for a description of the 'currents' in this part of the ocean."

188. In latitude 38° south, longitude 6° east, he found the water at 56°. His course then was a little to the south of east, to the meridian of 41° east, at its intersection with the parallel of 42° south. Here his water thermometer stood at 50°, but between these two places it ranged at 60° and upward, being as high on the parallel of 39° as 73°. Here, therefore, was a stream—a mighty "river in the ocean"—one thousand six hundred miles across from east to west, having water in the middle of it 23° higher than at the sides. This is truly a Gulf Stream contrast. What an immense escape of heat from the Indian Ocean, and what an influx of warm water into the frozen regions of the south! This stream is not always as broad nor as warm as Captain Grant found it. At its mean stage, it conforms more nearly to the limits assigned it in the diagram (Plate XIX.).

189. We have, in the volume of heated water reported by Captain Grant, who is a close and accurate observer, an illustration of the sort of *spasmodic* efforts—the heaves and throes—which the sea, in the performance of its ceaseless task, has sometimes to make. By some means, the equilibrium of its waters,

at the time of Captain Grant's passage, December—the southern summer—1852, appears to have been disturbed to an unusual extent; hence this mighty rush of overheated waters from the great inter-tropical caldron of the two oceans, down toward the south.

Instances of commotion in the sea at uncertain intervals—the making, as it were, of efforts by fits and starts to keep up to time in the performance of its manifold offices—are not unfrequent, nor are they inaptly likened to spasms. The sudden disruption of the ice which arctic voyagers tell of, the immense bergs which occasionally appear in groups near certain latitudes, the variable character of all the currents of the sea—now fast, now slow, now running this way, then that—may be taken as so many signs of the tremendous throes which occur in the bosom of the ocean. Sometimes the sea recedes from the shore, as if to gather strength for a great rush against its barriers, as it did when it fled back to join with the earthquake and overwhelm Callao in 1746, and again Lisbon nine years afterward. The tide-rips in mid-ocean, the waves dashing against the shore, the ebb and flow of the tides, may be regarded, in some sense, as the throbbings of the great sea pulse.

The motions of the Gulf Stream (§ 143), beating time for the ocean and telling the seasons for the whales, also suggest the idea of a pulse in the sea, which may assist us in explaining some of its phenomena. At one beat, there is a rush of warm water from the equator toward the poles; at the next beat, a flow from the poles toward the equator. This sort of pulsation is heard also in the howlings of the storm and the whistling of the wind; the needle trembles unceasingly to it, and tells us of magnetic storms of great violence, which at times extend over large portions of the earth's surface; and when we come to consult the records of those exquisitely sensitive anemometers, which the science and ingenuity of the age have placed at the service of philosophers, we find there that the pulse of the atmosphere is never still; in what appears to us the most perfect calm, the recording pens are moving to the pulses of the air.

190. Now, if we may be permitted to apply to the Gulf Stream and to the warm flows of water from the Indian Ocean an idea suggested by the functions of the human heart in the circulation of the blood, we perceive how these pulsations of the great sea-heart may perhaps assist in giving circulation to its waters through the immense system of aqueous veins and arteries that run between the equatorial and polar regions. The waters of the Gulf Stream, moving together in a body through such an extent of ocean, and being almost impenetrable to the cold waters on either side—which are, indeed, the banks of this mighty river—may be compared to a wedge-shaped cushion placed between a wall of waters on the right and a wall of waters on the left. If now we imagine the equilibrium of the sea to be disturbed by the heating or cooling of its waters to the right or the left of this stream, or the freezing or thawing of them in any part, or if we imagine the disturbance to take place by the action of any of those agencies which give rise to the motions which we have called the pulsations of the sea, we may conceive how it might be possible for them to force the wall of waters on the left to press this cushion down toward the south, and then again for the wall on the right to press it back again to the north, as (§ 144) we have seen that it is.

Now the Gulf Stream, with its head in the Straits of Florida, and its tail in the midst of the ocean (§ 173), is wedge-shaped; its waters cling together (§ 131), and are pushed to and fro—squeezed, if you

please—by a pressure (§ 143), now from the right, then from the left, so as to work the whole wedge along between the cold liquid walls which contain it. May not the velocity of this stream, therefore, be in some sort the result of this working and twisting, this peristaltic force in the sea?

In carrying out the views suggested by the idea of pulsations in the sea, and their effects in giving dynamical force to the circulation of its waters, attention may be called to the two lobes of polar waters that stretch up from the south into the Indian Ocean, and which are separated by a feeble flow of tropical waters. Icebergs are sometimes met with in these polar waters as high up as the parallel of the fortieth degree of latitude. Now, considering that this tropical flow in mid-ocean is not constant—that many navigators cross the path assigned to it in the plate without finding their thermometer to indicate any increase of heat in the sea; and considering, therefore, that any unusual flow of polar waters, any sudden and extensive disruption of the ice there, sufficient to cause a rush of waters thence, would have the effect of closing for the time this mid-ocean flow of tropical waters, we are entitled to infer that there is a sort of conflict, at times, going on in this ocean between its polar and equatorial flows of water. For instance, a rush of waters takes place from the poles toward the equator. The two lobes close, cut off the equatorial flow between them, and crowd the Indian Ocean with polar waters. They press out the overheated waters; hence the great equatorial flow encountered by Captain Grant.

Thus this opening between the cold-water lobes appears to hold to the chambers of the Indian Ocean, with their heated waters, the relations which the valves and the ventricles of the human heart hold to the circulation of the blood. The closing of these lobes at certain times prevents regurgitation of the warm waters, and compels them to pass through their appointed channels.

From this point of view, how many new beauties do now begin to present themselves in the machinery of the ocean! its great heart not only beating time to the seasons, but palpitating also to the winds and the rains, to the cloud and the sunshine, to day and night (§ 174). Few persons have ever taken the trouble to compute how much the fall of a single inch of rain over an extensive region in the sea, or how much the change even of two or three degrees of temperature over a few thousand square miles of its surface, tends to disturb its equilibrium, and consequently to cause an aqueous palpitation that is felt from the equator to the poles. Let us illustrate by an example: The surface of the Atlantic Ocean covers an area of about twenty-five millions of square miles. Now, let us take one-fifth of this area, and suppose a fall of rain one inch deep to take place over it. This rain would weigh three hundred and sixty thousand millions of tons; and the salt which, as water, it held in solution in the sea, and which, when that water was taken up as vapor, was left behind to disturb equilibrium, weighed sixteen millions more of tons, or nearly twice as much as all the ships in the world could carry at a cargo each. It might fall in an hour, or it might fall in a day; but, occupy what time it might in falling, this rain is calculated to exert so much force—which is inconceivably great—in disturbing the equilibrium of the ocean. If all the water discharged by the Mississippi River during the year were taken up in one mighty measure, and cast into the ocean at one effort, it would not make a greater disturbance in the equilibrium of the sea than would the fall of rain supposed. Now this is for but one-fifth of the Atlantic, and the area of the

Atlantic is about one-fifth of the sea-area of the world; and the estimated fall of rain was but one inch, whereas the average for the year is (§ 35) sixty inches; but we will assume it, for the sea, to be no more than thirty inches. In the aggregate, and on an average, then, such a disturbance in the equilibrium of the whole ocean as is here supposed occurs seven hundred and fifty times a year, or at the rate of once in twelve hours. Moreover, when it is recollected that these rains take place now here, now there; that the vapor of which they were formed was taken up at still other places, we shall be enabled to appreciate the better the force and the effect of these pulsations in the sea.

191. Between the hottest hour of the day and the coldest hour of the night, there is frequently a change of four degrees in the temperature of the sea.* Let us, therefore, to appreciate the throbbings of the sea-heart, which take place in consequence of the diurnal changes in its temperature, call in the sunshine, the cloud without rain, with day and night, and their heating and radiating processes. And, to make the case as strong as, to be true to nature, we may, let us again select one-fifth of the Atlantic Ocean for the scene of operation. The day over it is clear, and the sun pours down his rays with their greatest intensity, and raises the temperature two degrees. At night the clouds interpose, and prevent radiation from this fifth, whereas the remaining four-fifths, which are supposed to have been screened by clouds, so as to cut off the heat from the sun during the day, are now looking up to the stars in a cloudless sky, and serve to lower the temperature of the surface waters, by radiation, two degrees. Here, then, is a difference of four degrees, which we will suppose extends only ten feet below the surface. The total and absolute change made in such a mass of sea water, by altering its temperature four degrees, is equivalent to a change it its volume of three hundred and ninety thousand millions of cubic feet.

192. Do not the clouds, night and day, now present themselves to us in a new light? They are cogs, and rachets, and wheels in that grand and exquisite machinery which governs the sea, and which, amid all the jarrings of the elements, preserves in harmony the exquisite adaptations of the ocean.

193. It seems to be a physical law, that cold-water fish are more edible than those of warm water. Bearing this fact in mind, as we study Plate XIX., we see at a glance the places which are most favored with good fish markets. Both shores of North America, the east coast of China, with the west coasts of Europe and South America, are all washed by cold waters, and therefore we may infer that their markets abound with the most excellent fish. The fisheries of Newfoundland and New England, over which nations have wrangled for centuries, are in the cold water from Davis's Strait. The fisheries of Japan and Eastern China, which almost, if not quite, rival these, are situated also in the cold water.

Neither India nor the east coasts of Africa and South America, where the warm waters are, are celebrated for their fish.

Three thousand American vessels, it is said, are engaged in the fisheries. If to these we add the Dutch, French, and English, we shall have a grand total, perhaps of not less than six or eight thousand, of all sizes and flags, engaged in this one pursuit. Of all the industrial pursuits of the sea, however, the

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* *Vide* Admiral Smyth's Memoir of the Mediterranean, p. 125.

whale fishery is the most valuable. Wherefore, in treating of the physical geography of the sea, a map for the whales would be useful.

The sperm whale is a warm-water fish. The *right* whale delights in cold water. An immense number of log-books of whalers have been discussed at the National Observatory, with the view of detecting the parts of the ocean in which the whales are to be found at the different seasons of the year. Charts showing the result have been published; they belong to the series of Wind and Current Charts.

In the course of these investigations, the discovery was made that the torrid zone is to the right whale as a sea of fire, through which he cannot pass; that the right whale of the northern hemisphere and that of the southern are two different animals; and that the sperm whale has never been known to double the Cape of Good Hope—he doubles Cape Horn.

With these remarks, and the explanations given on Plate XIX., the parts of the ocean to which the right whale most resorts, and the parts in which the sperm are found, may be seen at a glance.

MARITIME CONFERENCE HELD AT BRUSSELS,

FOR

DEVISING A UNIFORM SYSTEM OF METEOROLOGICAL OBSERVATIONS AT SEA;

AUGUST AND SEPTEMBER, 1853.

THE GOVERNMENTS REPRESENTED AT THE CONFERENCE, AND THE NAMES OF THE OFFICERS WHO ATTENDED, WERE:—

BELGIUM—by A. QUETELET, directeur de l'Observatoire royal, secrétaire perpétuel de l'Académie royale des sciences, des lettres, et des beaux-arts de Belgique;—and VICTOR LAHURE, capitaine de vaisseau, directeur général de la marine;

DENMARK—by P. ROTHE, Captain-Lieutenant Royal Navy, Director of the Depot of Marine Charts;

FRANCE—by A. DELAMARCHE, Ingénieur hydrographe de la marine impériale;

GREAT BRITAIN—by F. W. BEECHEY, Captain Royal Navy, F.R.S., etc., Member of the Naval Department of the Board of Trade;—and HENRY JAMES, Captain Royal Engineers, F.R.S., M.R.I.A., F.G.S., etc;

NETHERLANDS—by M. H. JANSEN, Lieutenant Royal Navy;

NORWAY—by NILS IHLEN, Lieutenant Royal Navy;

PORTUGAL—by J. DE MATTOS CORRÊA, Captain-Lieutenant Royal Navy;

RUSSIA—by ALEXIS GORKOVENKO, Captain-Lieutenant Imperial Navy;

SWEDEN—by CARL ANTON PETTERSSON, First Lieutenant Royal Navy;

UNITED STATES—by M. F. MAURY, LL.D., Lieutenant United States Navy.

The sixth edition of this work contained a copy of the proceedings of this Conference. I therefore content myself with an epitome, giving for this edition the results only.

THE CONFERENCE.

The proceedings of the first meeting commenced at the residence of the Minister of the Interior, on the 23d of August, 1853, at half-past eleven in the morning. Present: MM. Delamarche, Hydrographical Engineer of the Imperial French Navy; De Mattos Corrêa, J., Captain-Lieutenant of the Royal Portuguese Navy; Gorkovenko, Captain-Lieutenant of the Imperial Russian Navy; Ihlen, Lieutenant of the Royal

Norwegian Navy; Jansen, Lieutenant (of first class) of the Royal Dutch Navy; Lahure, Captain and Director-General of the Belgian Navy; Maury, Lieutenant of the Navy of the United States and Director of the Observatory at Washington; Pettersson (C. A.), Lieutenant of the Royal Swedish Navy; Quetelet, Director of the Observatory at Brussels.

The attention of the meeting was first directed to the choice of a president. Lieutenant Maury was requested to direct the proceedings, but he declined the honor; and, at his suggestion, in which other members of the meeting concurred, Mr. Quetelet took the chair.

The President submitted to the meeting the propriety of publishing the discussions of the Conference; expressing, as his own opinion, that publicity was one of the best methods of insuring the success of their undertaking; remarking, at the same time, that, independently of the information which would be conveyed to the public through the medium of the press, the minutes of each sitting and the scientific report of the Conference would thus be preserved.

Lieutenants Jansen and Maury seconded this motion.

Captain-Lieutenant Gorkovenko also expressed himself in favor of publicity. He announced to the meeting that he had just been informed that Captain Beechey, appointed by the English Government to take part in the proceedings of the Conference, would arrive at Brussels in the course of the evening.

The President next called on Lieutenant Maury to explain to the meeting the object of his mission.

Mr. Maury spoke as follows:—

"GENTLEMEN: The proposal, which induced the American Government to invite the present meeting, originated with the English Government, and arose from the communication of a project prepared by Captain Henry James, of the corps of Royal Engineers, by order of General Sir John Burgoyne, Inspector-General of Fortifications, in which the United States Government was invited to co-operate.

"Nineteen stations had been formed by the English authorities upon a uniform system, and the direction of the observations confided to the immediate supervision of the officers in command of the respective stations.

"In the United States, meteorological observations had been made since the year 1816.

"The American Government sympathized with the proposal of the English Government, but said: Include the sea, and make the plan universal, and we will go for it. I was then directed to place myself in communication with the ship-owners and commanders of the navy and mercantile marine, in furtherance of the plan.

"It is from the information extracted from more than a thousand logs that I have been able to prepare the Charts which have been published up to this time, showing the sailing-routes and the direction of the winds and currents.

"With a view, however, of extending still further these nautical observations, the Government of the United States decided upon bringing the subject under the consideration of every maritime nation, with the hope of inducing all to adopt a uniform model of log-book.

"In order to place the captains navigating under a foreign flag in a position to co-operate in this undertaking, Mr. Dobbin, Secretary of the Marine Department at Washington, has instructed me to make known that the mercantile marine of all friendly powers may, with respect to the Charts of the Winds and Currents, be placed on the same footing as those of the American Marine; that is to say, that every captain, without distinction of flag, who will engage to keep his log during the voyage upon a plan laid down, and afterwards communicate the same to the American Government, shall receive, gratis, the Sailing Directions and the Charts published.

"It has consequently been suggested to the captains, that they should provide themselves with, *at least*, one good chronometer, one good sextant, two good compasses, one marine barometer, and three thermometers for air and water. I make use of the expression *at least*, because the above is the smallest number of instruments with which a captain can fulfil the engagements he contracts upon receiving the Charts.

"Foreign flags will thus enjoy the advantage of profiting at once by all the information collected up to this time.

"You will not fail to observe, gentlemen, that the observations made on board of merchant vessels, with instruments frequently inexact, are not to be relied upon in the same degree as those made where the instruments are more numerous and more delicate, and the observers more in the habit of observing.

"The former, however, from the fact of their being more numerous, give an average result, which may be consulted with advantage; but the observations made on board the ships of the navy, although fewer in number, are evidently superior in point of precision.

"The object of our meeting, then, gentlemen, is to agree upon a uniform mode of making nautical and meteorological observations on board vessels of war. I am already indebted to the kindness of one of the members present, Lieutenant Jansen, of the Dutch Navy, for the extract of a log kept on board a Dutch ship of war, and which may be quoted as an example of what may be expected from skilful and carefully conducted observations. In order to regulate the distribution of the Charts, which the American Government offers gratuitously to captains, it would in my opinion be desirable that, in each country, a person should be appointed by the government, to collect and classify the abstracts of the logs, of which I have spoken, through whom also the Charts should be supplied to the parties desirous of obtaining them."

The President:—

"Gentlemen: I think I shall be anticipating the wishes of the members of this meeting, by proposing to them to pass, in the first place, a vote of thanks to Mr. Maury, and to record our gratitude for the enlightened zeal and earnestness he has displayed in the important and useful work which forms the subject of our deliberations."

All the members in turn intimated their entire concurrence in the proposal made by the President, to

express to Mr. Maury their admiration and their gratitude for the eminent services which he has already rendered, and is still endeavoring to render to the science of navigation.

COLUMNS PROPOSED BY THE CONFERENCE FOR THE ABSTRACT LOG.

DATE.—Mr. Beechey proposed to indicate the months by Roman figures, I. to XII., beginning with the month of January.

Mr. Gorkovenko remarked that Russia did not reckon dates according to the Gregorian calendar; nevertheless, as the object of the meeting was to arrive as nearly as possible at uniformity, he thought there would be no difficulty in adopting this calendar for meteorological observations.

It was resolved by the Conference that:—

"The time given in the abstract log should be civil time, but if not, mention the time which is given. Instead of writing the names of the months at length, denote them by Roman figures. Thus, for January I., for December XII."

HOURS.—"The Maritime Conference recommends the adoption of the hours inserted in the second column, namely: four in the morning, noon, and eight in the evening, for making observations to be recorded in the first seven columns."

LATITUDE AND LONGITUDE.—"The latitude and longitude should be observed frequently at sea, especially at the hours indicated in the second column, and the result recorded in the log at the hour nearest to those at which the observations are made, so as to determine as exactly as possible the position of the ship at those times. It will be more especially necessary to make these observations, when the ship is about to enter or cross any of the great currents or streams of the ocean (see *Currents*)."

If the longitude be determined by lunar distances, note it in the column with its proper sign. ⊙☾; if by chronometer, employ one of the following signs ○ or *.

Position by dead reckoning should be deduced from the position by the last observations.

CURRENTS.—"On ordinary occasions, the current is to be determined at noon on each day, by the difference between the position of the ship as found by observation and by dead reckoning, and the direction and rate given for the 24 hours; but where the ship is expected to pass through any of the great currents of the ocean, or when any change is anticipated, the position of the ship is to be frequently determined by observations, and the current computed for the intervals."

MAGNETIC VARIATION OBSERVED.—"Enter with the proper sign the variation ascertained, whether by azimuth or by amplitude."

"The variation entered should be what it would have been, if, at the time the observation was made, the ship had been in such a position that the local deviation would have been 0. In other words, the variation entered should be corrected for local deviation."

"The variation should be entered in degrees and minutes."

"When the variation is observed by the moon or a star, make after it the sign of ☾ or *."

"It is desirable that every ship co-operating in this system of observations, should have a standard compass on board, by which all the observations for variations should be made, and to which a fixed place should be assigned."

"In the selection of a spot for the standard compass, or of any compass intended to be used in making observations on the variation, care should be taken to select a position for the compass, when it is to be used for observation, in that part of the ship, or as near as possible, which is most free from the effects of local deviation, and that it always stand in the same place."

"When no observation has been obtained, the variation which has been used is to be inserted in the variation column, with an asterisk, the quantity having been corrected for the local attraction of the vessel."

Direction of the Wind.—The direction of the wind is the magnetic direction, with due allowance for appearances caused by the motion of the vessel. It is the direction of the wind which has prevailed for the last eight hours. It should be expressed to the nearest point of the compass.

Force of the Wind.—The force of the wind should be expressed in figures. The nomenclature of Admiral Beaufort was adopted.

In case of a squall, after the figure indicating the force of the prevailing wind, that of the squall to be entered in a parenthesis.

Form and Direction of the Clouds.—"Howard's nomenclature for the form of the clouds was adopted."

"When, at the same time, there are two currents, an upper and a lower current, they are to be entered one above the other, separated by a line."

Proportion of Sky Clear.—"The *proportion of sky clear* to be expressed by figures from 0 to 10, the figures indicating the extent of sky clear."

Hours of Rain.—"The hours of fog, rain, snow, and hail, are to be indicated by a letter for each of these elements, viz: *A* fog, *B* rain, *C* snow, and *D* hail."

Barometer.—"It will be necessary to place at the commencement of the log-book the corrections of the barometer, or the date for making these corrections, specifying the place where the comparison has been made."

Thermometer.—"If it rains at the time of observing the psychrometer, the letter *B* to be placed by the side of observation."

Hours.—The President expressed the opinion that, in order to ascertain at sea the diurnal variation of the meteorological instruments, it would be convenient to adopt the project of bi-hourly observations, proposed by the Royal Society of London, or at least the project of tri-hourly observations, suggested by Captain Beechey. The first project, more rigorous, would have the advantage to come in the plan of the observations already adopted on land, and to be more convenient for the division of time in the service at sea.

After a discussion on the matter, the following instruction was adopted.

Column 2.—"In this column shall be placed the following hours, viz: 4 A. M., noon, and 8 P. M., when all the observations shall be made and written upon the lines on which those numbers stand, for the columns 3, 3′, 4, 4′, 5, 6, 7, 8, 9, 10, 11, 11′, 12, 12′, and 13.—The observations of the 13′, 14, and 14′ columns should be made at least once a day. The observations for the columns 7, 7′, 11, 11′, 12, every two hours, if practicable; and if not, then at 9 A. M. and 3 P. M.

"But with reference to the columns 3′, 4′, and 6, it will be sufficient that the entries in these columns be made at noon on each day, except on such occasions as it may be desirable to detect the limits of any of the great currents of the ocean, or of the trade or other periodical wind, when a more frequent entry should be made, and the ship's place determined, at least at each of the hours specified in Column 2."

Mr. Gorkovenko. "Being perfectly convinced for myself of the great importance, both to science and navigation, of frequent observations, such as are comprised in the columns of our table, being made at sea, I ask permission to put a question with a view of eliciting the opinion of the Committee, viz: To what extent can the Navy comply with these requirements, and are they of opinion that the officers on board, having other duties to attend to, will be able to devote sufficient time to making the entire range of observations with the precision required? For it is to the Navy we must look more for correct than for numerous observations."

Mr. Maury. "I believe it is not only possible but very practicable and very easy. I think these observations may be made with perfect convenience, and with great benefit to science and navigation, by all ships of war that are provided with the instruments necessary for safe and proper navigation, more particularly as the whole of these observations are not to be made in person by the officer of the watch. As a general rule, he will appoint one of his subordinates whom he may consider qualified for that purpose. In the United States Navy, these observations are obtained without difficulty."

Captain James observed that in the trigonometrical survey of Great Britain, non-commissioned officers and privates of the royal sappers and miners were employed in making the observations necessary in determining the latitude and longitude of the trigonometrical stations, and the distances between them; that they used for these purposes the most expensive and delicate instruments, and that the officers superintending the operation of the survey had as much confidence in the observations made by them, as they had in the observations taken by the officers themselves; and consequently, he was of opinion that the meteorological observations which were considered necessary by the Conference, might, under the superintendence of the officers of the ship, be confided to steady persons acting under their orders.

Temperature of the Water at the Surface.—"There is a convenient method, which consists in hauling the water up, in a clean wooden bucket, and placing it in the shade; and, after the thermometer has remained in the bucket for two or three minutes, the thermometer should be read, the bulb remaining immersed until the observation is completed."

"Besides the stated periods, occasional observations, made in the same manner, should be entered under the head of Remarks, whenever, for any reasons, such as changes in the color of the water, vicinity

of ice, shoals, etc., approaches to the Gulf Stream, the mouth of large rivers, or other currents, the temperature of the water be tried."

"The temperature of the water should also be tried during thunder-storms, and the heavy display of electrical phenomena."

"The water for surface temperature should be drawn from the quarter boats, in order to get it as far from the ship's side as possible."

Temperature of the Water at certain Depths.—"The temperature *below* the surface of the water to be tried, may be taken from any depth that may to the observer seem good, stating in the column the temperature as a fraction, with the depth as the denominator: thus, $\frac{40°}{200}$ fathoms" [*i. e.* temperature at 200 fathoms, 40°].

"A hollow cylinder of wood, eighteen inches long, about 6 inches in diameter, with a valve near each end opening upwards, will be found, when attached to the deep-sea lead, convenient for bringing up the water from moderate depths."

"It is desirable frequently to try the temperature of the water at the depths of the ship's cock below the surface; before catching the water in the bucket, let it run freely for ten minutes, then put the bucket under, and, when full, let the thermometer stand before reading, as in the case of the surface water."

"Though it is important to have these observations as to temperature made in all parts of the ocean, yet there are parts in which the difference of temperature between the water at and below the surface possesses a peculiar interest; these parts are in the trade-wind regions generally, in the Indian Ocean, Indian Archipelago, and off the Cape of Good Hope, especially in and near Lagulla's Current, near the mouth of large rivers, and in the arctic and antarctic regions."

Specific Gravity of Water.—"The specific gravity, whether of water at or below the surface, should be given without any correction, except such as the instrument used may involve; the object of these two columns being to ascertain the specific gravity of sea water as it actually exists, the temperature of the water at the moment of making the observation should be noted."

"A variety of instruments will probably be used for the purpose of filling this column (specific gravity); it is therefore deemed advisable to have the description of the use of the specific-gravity instrument at the office from which each Navy may be supplied."

"It may be permitted, however, to express the hope that whatever be the instrument used, a uniform scale will be adopted for all; that is, that the specific gravity of pure distilled water will be adopted as the unity, and that the specific gravity of sea water will be expressed in decimals."

"It will be desirable to know whether the vessel on board of which the observations were made was a steamship, and if so, whether it was steaming or sailing."

"Enter, uncorrected for local attraction, the variation observed, with the time of observation and the direction of the ship's head."

"Frequent mention is made by navigators of tide-rips at sea, particularly within the tropics; a close

attention to these phenomena is recommended; noting, whenever they are seen, the age of the moon. Enter also sea-weed, drift-wood, and the like."

"It is desirable that navigators compare the phenomena connected with storms, thunder, lightning, etc., in other parts of the world, with the same phenomena in the vicinity of the Gulf Stream."

"When in those regions in which ice is liable to be met with, a frequent resort to the water-thermometer is recommended; because in such regions fogs are prevalent, and often conceal the approaching danger. The distance of ice, within several miles, will generally be indicated by the water-thermometer, especially when vessels are to windward of the bergs."

"When in the presence of ice, note the direction in which the ice has been drifted, and describe its appearance."

"Mention the time when the dew commences to fall, and, in cases of extraordinary deposits, note the temperature of the air as closely to the surface of the sea as can be done, taking the temperature at the masthead at the same time."

"When considerable differences are found between the temperature at and below the surface, observe also the wet and dry bulb, and enter their readings among the Remarks."

"It is desirable that vessels co-operating in this system of observations should, in addition to the thermometer with which ships usually are supplied, have a white and black bulb, and also a bulb of marine blue that is as nearly the color of sea water as may be."

"These three thermometers should be exposed to the sun in clear weather for a few minutes, and observed at 9 A. M., noon, and 3 P. M., and occasionally at night when the dew is heavy, and their readings should be entered in the column of Remarks."

"It is desirable that the bulbs of the colored thermometers be painted with water-color."

PSYCHRONOMETER.—"The wet bulb should be observed, after having been wetted with *fresh* water of the temperature of the air, and after the instrument has been held in the shade in the open air for some minutes."

"When at anchor, it is desirable that hourly observations with the meteorological instruments should occasionally be taken, and especially at the equinoxes and solstices."

"In the case of storms, tornadoes, and whirlwinds, it is desirable to have a full description of the phenomena, and all the circumstances connected with them: such as the appearance of the sky and clouds; the state of the barometer before, during, and after the event; the electrical displays connected with it; the quantity and time of rain or hail, etc. The barometer should be noted frequently, and the time mentioned at which every variation in it, that amounts to one-tenth of an inch, takes place."

"Also, it will be interesting for the navigator to avail himself of every favorable opportunity for determining the height and velocity of waves and the distance between them. He should note in this column the results, and describe the method used."

"When land birds and insects are met with at sea, the fact should be noted, and mention made of all the circumstances which are calculated to throw light upon their migration."

"Showers of dust and red fogs are sometimes met with at sea; in such cases, a description of the weather and of the appearance of the sky, as well as specimens of the dust, would be desirable."

"Note the direction of the winds which bring the rain, as well as the changes of the wind during and after the rain. By the term *rain*, hail and snow are understood to be included. With regard to hail, describe the stones and any peculiarity connected with the snow-flakes, being careful to note all the displays of electrical phenomena connected with the hail-storms."

"It would be interesting to know the temperature of the rain, and to have estimates of the quantity of dew."

"SOUNDINGS.—" Deep-sea soundings should be made on all favorable occasions; for making these soundings comparable, the uniformity in the size of line used and the weight of the sinker is a desideratum. The time occupied for every 100 fathoms in going out should be observed, for the discussion afterwards of the soundings. When the sinker is recovered, the specimen of the bottom ought to be carefully labelled and preserved."

"When in harbor, tidal observations should not be neglected; the times of high and low water, with the direction and force of the current at various stages, both on the flood and the ebb, should be noted. Likewise thunder and lightning, the time of their duration, intensity, etc. When marked changes in the color of the water are observed, try the temperature of the water, get a cast of the deep-sea lead if practicable." "In the Pacific Ocean, particularly, patches of pink or white-colored water are frequently met with; descriptions of them, with specimens of the water carefully preserved in phials with ground glass stoppers, are desirable."

"Waterspouts: a detailed description; containing the duration, the circumstances of their formation, gyration, motion, form, breaking up, etc."

"Shooting-stars: the number of them observed during a certain time; the point of the heaven (the star or constellation) from which they are emanating and towards which they are converging, in particular about the 10th of August and middle of November."

"Aurora Borealis: duration or time for beginning and ending; its extension, form, tract of the heaven, intensity of light, color, rays, its motions and changes, etc. Note anything that is particular about rainbows and halos and meteors of every description, describing their place by reference to stars or the horizon."

At the commencement of the log-book should be entered: 1. The name of the ship, the nature of materials of which it is built, cargo, captain's name, class of ship, names of ports put into during the period the log has been kept.

2. Tables showing amount of local deviations observed before departure; stating whether cargo on board or not at time of observation being made; the methods employed to ascertain the local deviation to be minutely described.

3. Admiral Beaufort's nomenclature for the winds.

4. Howard's nomenclature for the form of clouds.

5. The corrections, or the rules for correcting all the instruments employed, more particularly the barometer and thermometer, with the places where the instruments have been compared with the standard.

6. Description of instruments, and methods employed in making observations.

7. Note down the meridian from which the longitude is reckoned.

"In addition to the observations mentioned in the abstract log, it is desirable that each captain should write at the end any general remarks which his personal experience may suggest, more especially if he has frequently made the same voyage."

ABSTRACT LOG.

(1). ______________________________

(2). ______________________________

(3). ______________________________

(4). ______________________________

(5). Local Deviation:—

Before sailing.

SHIP'S HEAD.	DEGREES OF DEVIATION.	SHIP'S HEAD.	DEGREES OF DEVIATION.
NORTH. .		SOUTH. .	
N.N.E. . .		S.S.W. . .	
N.E. . . .		S.W. . . .	
E.N.E. . .		W.S.W. . .	
EAST. . .		WEST . .	
E.S.E. . .		W.N.W. .	
S.E. . . .		N.W. . . .	
S.S.E. . .		N.N.W. . .	

When arrived.

SHIP'S HEAD.	DEGREES OF DEVIATION.	SHIP'S HEAD.	DEGREES OF DEVIATION.
NORTH .		SOUTH. .	
N.N.E. . .		S.S.W. . .	
N.E. . . .		S.W. . . .	
E.N.E. . .		W.S.W. . .	
EAST. . .		WEST. . .	
E.S.E. . .		W.N.W. .	
S.E. . . .		N.W. . . .	
S.S.E. . .		N.N.W. . .	

(1). Enter the class of the vessel, her name, country, and the name of the captain.

(2). If the vessel is of iron or wood, and mention the quantity of iron, if any, in the cargo.

(3). Enter the names of the places at which the vessel has called during her voyage.

(4). Name the meridian from which the longitude is calculated.

(5). Give the table of local deviation at the commencement and at the end of the voyage; and state in the log the manner in which it was determined, and if the vessel was loaded with any iron when the observation was made, or whether any iron as cargo was taken on board after the observation was made.

If practicable, the operation should be repeated during the voyage.

ABSTRACT LOG ______________ CAPTAIN ______________

DATE.	HOUR.	LATITUDE BY		LONGITUDE BY		CURRENTS.		MAGNETIC VARIATION OBSERVED.	WINDS.		BAROMETER.	
		Observation.	D. R.	Observation.	D. R.	Direction.	Rate.		Direction.	Rate.	Height.	Ther. attach'd.
I. 31.	2											
	4											
	6											
	8											
	9											
	10											
Noon.	12											
	2											
	3											
	4											
	6											
	8											
	10											
	12											
II. 1.	2											
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
[a]	[b]	[a]	[c]	[a]	[c]	[a]	[a]	[a]	[a]	[a]	[a]	[a]

ABSTRACT LOG FOR THE

DATE.	HOUR.	LATITUDE.	LONGITUDE.	CURRENTS.		BAROMETER.		THERMOM.		FORMS AND DIRECTION OF CLOUDS.	PROP. OF SKY CLEAR.	HOURS OF FOG A. RAIN B. SNOW C. HAIL D.	MAGNETIC VARIATION OBSERVED.
				Direction.	Rate.	Height.	Ther. attach'd.	Air.	Water.				
I. 31.	4												
	9												
Noon.	12												
	3												
	8												
II. 1.	4												
	9												
Noon.	12												
	3												
	8												
2	4												
	9												
Noon.	12												
	3												
	8												
3	4												

FROM ______________ ____________ TO ______________________ 185

THERMOMETER.		FORMS AND DIRECTION OF CLOUDS.	PROPOR. OF SKY CLEAR.	HOURS OF FOG A. RAIN B. SNOW C. HAIL D.	STATE OF THE SEA.	WATER.			STATE OF THE WEATHER.	REMARKS.
Dry bulb.	Wet bulb.					Temp. at surface.	Specific gravity.	Temp. at depth.		
										This form is intended more especially for men-of-war.
(14) [a]	(15) [b]	(16) [a]	(17) [a]	(18) [a]	(19) [c]	(20) [a]	(21) [b]	(22) [b]	(23) [c]	(24) [a]

MERCHANT SERVICE.

WINDS.	RATE.	REMARKS.
		This form contains the minimum of what must be furnished by American merchantmen, in order to entitle them to a copy of Charts and Sailing Directions. It is hoped, however, that many of them at least will be willing to do more, and to fill up the man-of-war log. Forms of this will be given to all who will ask for them.
(Latter part.)		☞ When the Abstract Log is filled and returned for one voyage, the master should take care to provide himself with another; for every master who is once supplied with the Charts is expected to give his co-operation, and keep abstracts as long as they are required for the perfection or completion of the Charts.
(First part.)		
(Middle part.)		
(Latter part.)		

Describe on a blank page, in the beginning of your Abstract, the instruments you have on board, the manner of using them, and of making the observations.

BAROMETER (corrections to) . . . $\begin{cases} \text{Index error.} \\ \text{Capacity.} \\ \text{Capillarity.} \\ \text{Mean height above the sea.} \end{cases}$

Compared by Mr.

with the standard at 185

THERMOMETERS (correction to). [Number your thermometers, and state the corrections that are to be applied to the various readings of each, to make them correct.]

FORCE OF THE WIND indicated by numbers (sailing by the wind).

0. Calm.
1. Ship has steerage.
2. Clean full 1 to 2 knots.
3. Clean full 3 to 4 knots.
4. Clean full 5 to 6 knots.
5. With royals.
6. Top gallants over single reefs.
7. Double-reefed topsails.
8. Triple-reefed topsails.
9. Close-reefed topsails and courses.
10. Close-reefed main topsail and reefed foresail.
11. Staysails.

FORMS OF CLOUDS ARE: cirrus (*Ci.*); cumulus (*Cu.*); stratus (*St.*); nimbus (*Ni.*), etc. [See Plate XVI.]

The original reports in English and in French having been read and signed by all the members of the meeting, the President declared the Conference closed.

QUETELET.

EXPLANATORY NOTES FOR KEEPING THE ABSTRACT LOG.

The name of the *last* place from which the vessel sailed, and the place to which she is going, should be stated in the abstract.

1*st Column.*—THE TIME inserted in the abstract log should be civil time, but if astronomical [or sea] time is inserted, it should be so stated at the commencement of the log. The months should be indicated by the Roman letters from I. to XII., January being I. [December XII.]*

2*d Column.*—HOURS; this column contains all the hours at the even numbers, and in addition 9 A. M. and 3 P. M. The hours 4 A. M. and 9 A. M., noon, 3 P. M. and 8 P. M. are printed in larger type, to indicate that it is at these hours that observations are especially required, as will be further explained.

3*d Column.*—LATITUDE OBSERVED.

4*th Column.*—LATITUDE BY DEAD RECKONING.

5*th Column.*—LONGITUDE OBSERVED.

6*th Column.*—LONGITUDE BY DEAD RECKONING.

The latitude and longitude should be observed frequently at sea, and more especially about 4 A. M., noon, and 8 P. M., and the result referred by the log to the hour nearest to which the observations were made, in order that the ship's position may be as accurately determined as possible at those times. This should be particularly attended to, when the ship is expected to cross or enter upon any of the great streams and currents of the ocean, the trade or periodical winds. The position by dead reckoning should be deduced from the last observation for latitude and longitude. If the longitude is determined by lunar distances, note it in the column with its proper sign ○☾,*☾, and if by chronometer ⊙ or *. When in sight of land, and the ship's position is determined by bearings, it is still desirable that the position of the ship should be given in latitude and longitude, in the proper column.

7*th* and 8*th Columns.*—DIRECTION AND RATE OF CURRENTS; on ordinary occasions, the currents should be determined at noon on each day, by comparing the position of the ship as determined by observation, and its position as found by dead reckoning; the direction and rate of the current in nautical miles for the

* The remarks contained in brackets [ ] are added by me.—M. F. M.

last twenty-four hours should be given [or, better, for the time during which it has been felt]; besides the daily entry at noon, the rate and direction of currents should be noted at shorter intervals, when the ship is in the vicinity of the great oceanic currents, or when it is supposed that the currents may sensibly vary in the twenty-four hours.

9th Column.—The observed Variation should be entered in degrees and minutes; and when the variation is determined by observation of the moon or a star, the sign ☾ or * should be placed after the entry, thus: 23° 16′ W. ☾.

The variation should be corrected for local attraction; in other words, the variation entered should be what the variation would have been, had the ship been heading at the time of observation upon the course in which the local variation would be O.

It is desirable that every vessel should be provided with a *standard compass*, with which all the observations for variation should be made. The position of the standard compass, or of the one used, should be that at which the local attraction is the least, and the compass should always be placed in the same place. When the variation has not been observed, the variation *used* should be corrected for local attraction, and noted.

10th Column.—Direction
11th Column.—Force
of the Wind.

The direction and force of the wind should be regularly entered at 4 A. M., noon, and 8 P. M. The force and direction entered should be that which has been most prevalent during the eight preceding hours. The direction should be by compass, and expressed in points. The force of the wind should be indicated by the figures given in the first page; if there are squalls, their force should be given in a parenthesis ( ), opposite the hour at which it takes place.

12th and *13th Columns.*—The Barometer and its Thermometer should be observed, if possible, at all the hours given in Column 2, and at least at 4 and 9 A. M., noon, 3 and 8 P. M. [The thermometer attached to the barometer—and if none be attached, one should be tied to the lower end—should be carefully noted whenever the barometer is observed, for we depend upon it for an important correction for the Bar.]

14th and *15th Columns.*—The Dry and Wet Bulb Thermometers should be observed at the same hours as the barometer. If it rains at the time when the observation with the wet bulb is taken, put the letter B after the temperature. Before reading the wet bulb thermometer, the bulb [or, rather, a thin old linen rag should be tied tightly about the bulb, and then the bulb] should be moistened with fresh water, and allowed to remain a few minutes in the open air, in the shade, and where strong currents of wind from the sails cannot affect it.

All the thermometers ought to have two scales, one that of the country to which the ship belongs, the other the centigrade.

16*th Column.*—THE FORM AND DIRECTION OF THE CLOUDS should be noted at least at 4 A. M., noon, and 8 P. M., and as they appear at the time of observation. The form of the clouds should be indicated by the letters given at page 194. When the clouds are observed to be going in different directions at the same time, the direction of the upper ones should be stated above that of the lower, and separated by a bar, thus: $\frac{\text{N. N. E. Ci}}{\text{S.W. Cu}}$. [Plate XVI. shows the form of Clouds.]

17*th Column.*—THE PROPORTION OF THE SKY CLEAR should be indicated by figures from 0 to 10. Thus 8 indicates that $\frac{8}{10}$ of the sky is clear.

18*th Column.*—FOG, RAIN, SNOW, AND HAIL. The number of hours of fog, rain, snow, and hail, in the eight preceding hours, should be noted at 4 A. M., noon, and 8 P. M.

The letter A, indicates fog; C, snow;

B, rain; D, hail.

One or two bars placed under the hours indicate degree [intensity, or quantity]; thus 3 B, is 3 hours of light rain; 3 $\underline{\text{B}}$, rain; 3 $\underline{\underline{\text{B}}}$, heavy rain.

The direction and force of the wind, etc., before, during, and after the rain, should be stated in the column of Remarks.

19*th Column.*—THE STATE OF THE SEA during the eight preceding hours should be stated at 4 A. M., noon, and 8 P. M., by means of the signs given on the second page. [These signs were omitted to be inserted in the original.]

20*th Column.*—TEMPERATURE OF THE WATER AT THE SURFACE. For the hours at which the observations should be taken, see directions for the barometer and thermometer. The water should be taken up in a wooden bucket, as far as possible from the ship's side, and placed in the shade on deck; the thermometer should then be placed in the water, and left there for two or three minutes [five], and read afterwards, whilst the bulb is in the water. In addition to the ordinary observations, the temperature of the water should be taken when any particular circumstances may seem to make it desirable, as when there are changes in the color of the water, [or when the vessel is] in the neighborhood of ice, shoals, the gulf or other streams, and at the mouths of great rivers.

The temperature of the water should also be taken during thunder-storms, and when any electrical phenomena are observed.

21*st Column.*—The SPECIFIC GRAVITY OF THE WATER AT THE SURFACE OR AT DIFFERENT DEPTHS, should be noted at least once a day; when the water is taken from a certain depth, the depth should be entered under the specific gravity, and under a line ($\frac{039}{150}$). The specific gravity is stated without any other correction than that which the instrument employed may require. The temperature of the water should be placed in the 20th and 22d columns. It is desirable that a uniform scale should be adopted in the instruments used in ascertaining the specific gravity; that the specific gravity of distilled water should be the unit, and that of the sea water expressed in decimals. [The hydrometer of commerce, that is, the one of glass, and in the shape of a thermometer with a huge bulb slightly loaded, used for proving spirits, is the one recommended for the American service.]

22*d Column.*—The TEMPERATURE OF THE WATER AT DIFFERENT DEPTHS, should be taken at least once a day, according as circumstances may be more or less favorable; the temperature [at the surface] should be entered above the specific gravity and separated from it by a bar ($\frac{54^\circ}{35}$); the unit of measure in depths is [fathoms of six feet each, English]. In taking water from moderate depths, it may be hauled up in a cylindrical box, 18 inches long and six inches in diameter, having two valves in the ends opening upwards. This box may be either of wood or iron, and attached to the deep-sea lead. [Self-registering *metallic* thermometers are better.]

It is desirable, frequently, to try the temperature of the water at the depth of the ship's cock below the surface; the cock should be left open for 8 or 10 minutes before the bucket is filled, and the thermometer should be left two or three minutes [five] in the water, as before described, before reading it, and it may be well to note the rate of the ship at the time the cock was open. The temperature of the water at the surface should be observed, whenever the temperature at different depths is taken.

When there is a great difference between the temperature of the water at the surface, and at some depth, observe the indications of the wet and dry bulb thermometers, and note them in the column of Remarks.

Although these observations are of importance in every part of the globe, still, there are certain regions where the differences between the temperature at the surface and the temperature at certain depths have a particular interest. We may mention the regions of the trade-winds, the Indian Ocean, the Cape of Good Hope, and especially in the Lagullas current, and near the mouths of great rivers.

COLUMN OF REMARKS.—The column of Remarks will contain everything which the captain may consider useful. We direct attention to the following points:—

1*st.* If the vessel is a steamer, state whether she was steaming or under sail at the time the observations are made.

Tempests, tornadoes, whirlwinds, typhoons, or hurricanes, etc.—Every circumstance connected with these should be stated in great detail, the different changes of the wind, the appearance of the sky and the clouds, of the sea and electrical phenomena, rain, hail, etc. The height of the barometer should be frequently noted, at least as often as there is a change of a tenth of an inch, and the time when the remarks are made [*i. e.* when the phenomena are seen, or when the observations are made] should be stated.

When *waterspouts* are observed, the time of their duration, their successive appearances, their formation, gyratory movement, translation, and breaking up, should be described.

Note the circumstances attending storms, the thunder, lightning, etc.; and when phenomena of this nature are observed by navigators, they should be guided in their observations by a reference to analogous phenomena, which they may have observed in other regions, more especially upon the edge of the Gulf Stream.

It is desirable to have the *temperature of the rain* compared with the temperature of the air.

When it *hails*, describe the *hailstones*, and the electrical phenomena.

Note the quantity of *dew*, the time when it commences to fall, and, in cases of extraordinary deposits,

note the temperature of the air as close to the surface of the sea as possible, and at the same time at the masthead.

When *red fogs* or *showers of dust* are met with, describe the weather and the appearance of the sky, and obtain, if possible, specimens of the dust.

Observe the height of the *waves*, the distance between them, and their rate of progress.

Note the *tide-rips* seen, particularly in the tropics, and the age of the moon at the time.

When the surface of the sea is covered with *pink or white patches* of water, as is often the case in the Pacific Ocean, describe them, and preserve specimens of the water in phials with ground glass stoppers; if practicable, get a cast of the deep-sea lead, and take the temperature of the water at the surface, and at some depth.

When *deep-sea soundings* are taken, state the time the lead takes to descend each 100 fathoms, and carefully preserve whatever the lead brings up from the bottom. [Deep-sea soundings should always be made from a boat.]

It is much to be desired, for the sake of comparison, that the same sized line and the same shaped lead, of equal weight, should be used. [For description of those used in the U. S. Navy, see *Maury's Sailing Directions*.]

In places where *ice* may be met with, observe the temperature of the water frequently; these observations are most valuable when there are fogs which may prevent the ice from being seen, as they may indicate its presence even at the distance of 2 or 3 miles, especially when the ice is to leeward.

Note the appearance of the ice, and the direction in which it has been drifted.

In addition to the *thermometers* usually supplied to ships, it is desirable that they should be furnished with others *with white, black, and blue bulbs*, colored with water colors. These three thermometers should be exposed simultaneously to the sun, in fine weather, for some minutes, at 9 A. M., noon, and 3 P. M., and occasionally at night [to the open sky] in time of dew; their indications should be entered in the column of Remarks.

Note the *shooting stars;* their point of departure and the point to which they appear to converge, the constellations which they traverse, their numbers in a given time. They should be especially observed about the 10th of August and the middle of November.

The *aurora borealis*, the time of its appearance and disappearance, extent, form, position, intensity of light, color, its motions, and changes should be described.

Halos, *rainbows*, *meteors*, etc., should also be noted.

Carefully note the appearance of *birds*, *insects*, *fish*, *sea-weed*, *drift wood*, and mention any circumstances which may throw light upon their appearance.

When at anchor, *tidal observations* should not be neglected, and the times of high and low water, if possible, should be observed; state the time also of change of tide, the rate and direction of the current at various stages, both on the flow and ebb, and everything relative to this important question. Hourly meteorological observations, especially at the times of the equinoxes and solstices, would be very valuable.

In addition to the observations mentioned in the abstract log, it is desirable that each captain should write at the end any general remarks which his personal experience may suggest [as to the route pursued, currents, winds, &c., encountered by the way], more especially if he has frequently made the same voyage.

REPORT OF THE CONFERENCE HELD AT BRUSSELS,

At the Invitation of the Government of the United States of America, for the Purpose of concerting a Systematical and Uniform Plan of Meteorological Observations at Sea.

In pursuance of instructions issued by the governments respectively named in the margin, the officers whose names are hereunto annexed assembled at Brussels, for the purpose of holding a Conference on the subject of establishing a uniform system of meteorological observation at sea, and of concurring in a general plan of observation on the winds and currents of the ocean, with a view to the improvement of navigation, and to the acquirement of a more correct knowledge of the laws which govern those elements.

The meeting was convened at the instigation of the American Government, consequent upon a proposition which it had made to the British Government, in reply to a desire which had been conveyed to the United States, that it would join in a uniform system of meteorological observation *on land*, after a plan which had been prepared by Captain James, of the Royal Engineers, and submitted to the Government by Sir J. Burgoyne, Inspector-General of Fortifications.

The papers connected with this correspondence were presented to the House of Lords on 21st February last,* and have been further explained in the minutes of the Conference. And it is here merely necessary to observe that, some difficulties having presented themselves to the immediate execution of the plan proposed by the British Government, the United States availed themselves of the opportunity afforded by this correspondence, of bringing under the notice of the British Government a plan, which had been submitted by Lieutenant Maury, of the United States Navy, for a more widely extended field of research than that which had been proposed; a plan which, while it would forward the object entertained by Great Britain, would at the same time materially contribute to the improvement of navigation and to the benefit of commerce.

An improvement of the ordinary sea route between distant countries had long engaged the attention of commercial men, and both individuals and nations had profited by the advances which this science had made through a more correct knowledge of the prevailing winds and currents of the ocean. But experience had shown that this science, if it did not now stand fast, was at least greatly impeded by the want of a more extended co-operation in the acquirement of those facts which were necessary to lead to a more correct knowledge of the laws which govern the circulation of the atmosphere, and control the currents of the ocean; and that the subject could not receive ample justice, nor even such a measure of it

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* See Parliamentary Papers, No. 115.

as was commensurate with the importance of its results, until all nations should concur in one general effort for its perfection. But could that happy event be brought about—could the observations be as extensive as desired, and receive that full discussion to which they were entitled—the navigator would learn with certainty how to count upon the winds and currents in his track, and to turn to the best advantage the experience of his predecessors.

Meteorological observations to a certain extent had long been made at sea, and Lieutenant Maury had turned to useful account such as had, from time to time, fallen into his hands;* but these observations, although many of them good in themselves, were but isolated facts, which were deprived of much of their value from the absence of observations with which they could be compared; and above all, from the want of a constant and uniform system of record, and from the rudeness of the instruments with which they had been made.

The moment, then, appeared to him to have arrived, when nations might be induced to co-operate in a general system of meteorological research. To use his own words, he was of opinion that "the navies of all maritime nations should co-operate, and make these observations in such a manner and with such means and implements, that the system might be uniform, and the observations made on board one public ship be readily referred to and compared with the observations made on board all other public ships, in whatever part of the world. And, moreover, as it is desirable to enlist the voluntary co-operation of the commercial marine, as well as that of the military of all nations, in this system of research, it becomes not only proper, but politic, that the forms of the abstract log to be used, the description of the instruments to be employed, the things to be observed, with the manipulation of the instruments, and the methods and modes of observation should be the joint work of the principal parties concerned."

These sentiments being concurred in by the Government of the United States, the correspondence between the governments was continued, and finally each nation was invited to send an officer to hold a conference at Brussels, on a given day.

And that the system of proposed observation and of combined action might become immediately available, and be extended to its widest possible field of operation, it was determined to adapt the standard of the observations to be made to the capabilities of the instruments now in general use in the respective naval services, but with the precaution of having all these instruments brought under the surveillance of parties duly appointed to examine them and determine their errors; as this alone would render the observations comparable with each other through the medium of their respective standards.

The Conference opened its proceedings at Brussels, on August 23, 1853, at the residence of M. Piercot, the Minister of the Interior, to whom the thanks of the Conference are especially due.

M. Quetelet was unanimously elected President.

Before entering upon any discussion, it was the desire of all the members of the Conference that it

* See Sailing Directions, by Maury.

should be clearly understood that, in taking part in the proceedings of the meeting, they did not in any degree consider themselves as committing their respective governments to any particular course of action, having no authority whatever to pledge their country in any way to these proceedings.

The objects of the meeting having been explained by Lieutenant Maury, of which the substance has been already given,* the Conference expressed its thanks to that officer, for the enlightened zeal and earnestness he had displayed in the important and useful work which forms the subject of the deliberations of the Conference.

In concerting a plan of uniform observation, in which all nations might be engaged, the most obvious difficulty which arose, was from the variety of scales in use in different countries. It is much to be desired that this inconvenience should be removed; but it was a subject upon which the Conference, after mature deliberation, determined not to recommend any modification, but to leave to each nation to continue its scales and standards as heretofore; except with regard to the thermometers, which it was agreed should, in addition to the scale in use in any particular service, have that of the centigrade placed upon it, in order to accustom observers in all services to its use, with a view to its final and general adoption.

The advantages of concert of action between the meteorologist on land and the navigator at sea, were so obvious, that, looking forward to the establishment of a universal system of meteorological observation upon both elements, it was thought that the consideration of scales would, with greater propriety, be left for that or some such occasion.

As to the instruments to be recommended, the Conference determined to add as few as possible to such as were in common use in vessels of war; but regarding accuracy of observation as of paramount importance, the Conference felt it to be a matter of duty, to recommend the adoption of *accurate* instruments, of barometers and thermometers especially that have been carefully compared with recognized standards, and have had their errors accurately determined; and that such instruments only should be used on board every man-of-war co-operating in this system, as well as on board any merchantman, as far as it may be practicable.

The imperfection of instruments in use at sea is notorious. The barometer having hitherto been used principally as a monitor to the mariner, to warn him by its fluctuations of the changes in prospect, its absolute indication of pressure has been but little regarded; and makers seldom if ever determine the real errors of these instruments, or, if known, still more rarely ever furnish the corrections with the instruments themselves.

That an instrument so rude and so abundant in error, as is the marine barometer generally in use,

* See the Minutes of the Proceedings of the Conference.

should, in this age of invention and improvement, be found on board any ship, will doubtless be regarded hereafter with surprise; and it will be wondered how an instrument so important to meteorology and so useful to navigation, should be permitted to remain so defective that meteorologists, in their investigations concerning the laws of atmospheric pressure, are compelled, in great measure, to omit all reference to the observations which have been taken with them at sea. The fact will, it is believed, afford a commentary upon the marine barometers now in use, which no reasoning or explanation can render more striking.

It was the opinion of the Conference that it would not be impossible, considering the spirit of invention and improvement that is now abroad in the world, to contrive a marine barometer which might be sold at a moderate price, that would fulfil all the conditions necessary to make it a good and reliable instrument; and a resolution was passed to that effect, in order to call the attention of the public to the importance of an invention, which would furnish the navigator with a marine barometer that, at all times, and in all weathers at sea, would afford the means of absolute and accurate determinations.

The Conference was also of opinion that an anemometer, or an instrument that would enable the navigator to measure the force, velocity, and direction of the wind at sea, was another desideratum.

The Conference was of opinion that the mercurial barometer was the most proper instrument to be used at sea for meteorological purposes, and that the aneroid should not be substituted for it.

With regard to thermometers, the Conference does not hesitate to say, that observations made with those instruments the errors of which are not known, are of little value; and it is, therefore, recommended, as a matter well worth the attention of co-operators in this system of research, whether some plan may not be adopted in different countries, for supplying navigators, as well in merchantmen as in men-of-war, with thermometers the errors of which have been accurately determined.

For the purposes of meteorology, various adaptations of the thermometer have been recommended, such as those which refer to hygrometry and solar radiation; and accordingly a space will be found in the columns for temperature by thermometers, with dry, wet, and colored bulbs. With these exceptions, the only instrument, in addition to those generally used at sea, for which the Conference has thought proper to recommend a column, is that for specific gravity; the cost of this instrument is too insignificant to be mentioned.

The reasons for recommending the use at sea of the wet, the white and black bulb thermometers are obvious; but with regard to the thermometer with a bulb the color of sea water, and the introduction on board ship of a regular series of observations upon the specific gravity of sea water, it may be proper to remark that, as the whole system of ocean currents and of the circulation of sea water depends in some degree upon the relative specific gravities of the water in various parts of the ocean, it was judged desirable to introduce columns for this element, and to recommend that observations should be carefully made with regard to it, both at and below the surface.

With respect to the thermometer having a bulb of the color of sea water, it is unnecessary to say more

in favor of its use on board ship, than that the object is to ascertain, whether or not such observations will throw any light upon the psychrometry of the sea, or upon any of the various interesting phenomena connected with the radiation from the surface of the ocean.

In bringing to a conclusion the remarks upon instruments, the Conference considered it desirable, in order the better to establish uniformity, and to secure comparability among the observations, to suggest, as a measure conducive thereto, that a set of the standard instruments used by each of the co-operating governments, together with the instructions which might be given by such government for their use, should be interchanged.

The object of the Conference being to secure as far as possible uniformity of record, and such a disposition of the observations that they would admit of ready comparison, the annexed form of register was concerted and agreed upon. The first columns of this form will receive the data which the Government of the United States requires merchant vessels to supply in order to entitle them to the privileges of co-operators in this system of research, and may, therefore, be considered as the *minimum* of what is expected of them. This condition, it may be as well to state here, requires that at least the position of the vessel and the set of the current, the height of the barometer, the temperature of the air and water should each be determined once a day, the force and direction of the wind three times a day, and the observed variation of the needle occasionally.

Every abstract log kept by a merchant vessel should contain *at least* what is here recommended. Anything more would enhance its value, and make it more acceptable.

The remaining columns are intended principally for men-of-war to fill up, *in addition* to those above mentioned; but it is believed that there are many officers in the mercantile navy also who are competent to this undertaking, and who will, it is hoped, be found willing to distinguish themselves in this joint action for the mutual benefit of the services.

In the compilation of this form, the Conference has had carefully in view the customs of the service and the additional amount of attention which these duties will require; and it is believed that the labor necessary for the purpose, at least to the extent specified in the instructions for filling up the columns, is only such as can be well performed under ordinary circumstances, and it has considered it a *minimum*, and looks with confidence to occasional enlarged contributions from zealous and intelligent laborers in the great cause of science.

The directions for filling up the columns and for making certain observations, it will be seen by the Minutes, were limited to such only as seemed necessary to the Conference to insure uniformity of observation. This subject received the benefit of much discussion before the meeting, and it was considered most advisable to confine the matter to *hints;* which, it is hoped, will be found sufficient, when embodied in the instructions which each nation will probably issue with the forms, to insure that most desirable end, uniformity.

The Conference, having brought to a close its labors with respect to the facts to be collected, and the means to be employed for that purpose, has now only to express a hope that whatever observations may be made will be turned to useful account when received, and not be suffered to lie dormant for the want of a department to discuss them; and that, should any government, from its limited means, or from the paucity of the observations transmitted, not feel itself justified in providing for their separate discussion, it is hoped that it will transfer the documents or copies of them to some neighboring power, which may be more abundantly provided, and willing to receive them.

It is with pleasure that the Conference has learned that the Government of Sweden and Norway has notified its intention of co-operating in the work, and that the king has commanded the logs kept by his Swedish subjects to be transmitted to the Royal Academy of Science at Stockholm; and also that, in the Netherlands, Belgium, and Portugal, measures have been taken to establish a department for the same purpose, and that the Admiralty of Great Britain has expressed its intention of giving instructions for meteorological observations to be made throughout the Royal Navy.

The Conference has avoided the expression of any opinion as to the places or countries in which it would be desirable to establish offices for the discussion of the logs; but it is confidently hoped that, whatever may be done in this respect, there will be always a full and free interchange of materials, and a frequent and friendly intercourse between the departments; for it is evident that much of the success of the plan proposed will depend upon this interchange, and upon the frankness of the officers who, in the several countries, may conduct these establishments.

Lastly, the Conference feels that it would but inadequately discharge its duties, did it close this report without endeavoring to procure for these observations a consideration which would secure them from damage or loss in time of war, and invites that inviolate protection which science claims at the hands of every enlightened nation; and that, as vessels on discovery or scientific research are, by consent, suffered to pass unmolested in time of war, we may claim for these documents a like exemption; and hope that observers, amidst the excitement of war, and perhaps enemies in other respects, may in this continue their friendly assistance, and pursue their occupation, until at length every part of the ocean shall be brought within the domain of philosophic research, and a system of investigation shall be spread as a net over its surface, and it become rich in its benefit to commerce, navigation, and science, and productive of good to mankind.

The members of the Conference are unwilling to separate without calling the attention of their respective governments to the important and valuable assistance which it has received from the Belgian Government. That the Conference has been enabled to draw its labors to so speedy and satisfactory a close, is in a great measure owing to the facilities and conveniences for meeting and deliberating, which have been afforded by His Majesty's Government.

Signed at Brussels, this 8th day of September, 1853.

BELGIUM—MM. Quetelet, *President;* Lahure. DENMARK—P. Rothe. FRANCE—Delamarche. GREAT BRITAIN—F. W. Beechey, H. James. NETHERLANDS—Jansen. NORWAY—Ihlen. PORTUGAL—De Mattos Corrêa. RUSSIA—Gorkovenko. SWEDEN—Pettersson. UNITED STATES—Maury.

The Brussels Conference did not pretend to prescribe any series of observations for merchantmen. They are the amateur meteorologists of the sea; their assistance is valuable, and their hearty co-operation greatly to be desired. But inasmuch as the power to compel merchant captains to keep an abstract log, according to the form prescribed, and with proper instruments, is not the same in all countries; and inasmuch as the relations between the merchant captain and his government are both special and peculiar, according to the flag under which he sails, it was deemed wisest and best to leave it to each government to select the columns from the abstract log proposed, which its merchantmen should be required to fill.

Not so with the men-of-war. Here the government has but to command, and it is done.

So, too, with the meteorologists on the land. The great body of them also is made up of amateurs. But governments have their military posts, their light-houses, hospitals, institutions of learning, observatories, and other public establishments answering to men-of-war, where meteorological observations have already been instituted, or where they may be instituted almost without cost.

Meteorological observations, whether made by sea or land, unless they be discussed, properly collated and published, have very little value.

Now, in most governments, there is provision already made for discussing and publishing such observations as are made at government establishments, and it is to governments that we must look chiefly for preliminary discussions and early publications.

The most liberal and enlightened offer on the part of the Secretary of the Navy, to furnish with a set of Wind and Current Charts, every merchant captain, whatever his flag, who will assist in collecting materials for them, secures the co-operation of this most able and efficient class of observers in carrying out the system of observations at sea, as recommended by the Brussels Conference.

A similar offer on the part of each government to its own amateur meteorologists, with regard to the observations on the land, would not fail to secure for the proposed universal system the hearty co-operation of this class also.

Meteorological observations which, after being made, remain in pigeon-holes without being published, had almost as well, all will admit, so far as the world is concerned, not have been made. And meteorological observations, though never so well made at an isolated station, and though they be ably discussed and duly published, yet even they are possessed of comparatively little value, unless they be compared and grouped with others taken under like circumstances in other parts of the world. When this is done, their true value begins to appear.

The whole earth is surrounded with meteorological agencies, which have a direct bearing upon its productions, and climates, and the well-being of all its inhabitants.

They are equally interested in the interpretation of the laws which govern those subtile agencies, and, therefore, it is proper that all nations should unite in one general effort to read them correctly.

So far as the sea is concerned, this has been done. A joint national and individual co-operation has been established, and, consequently, legislatures have not been called on for additional and heavy

appropriations, or any grievous or new imposition of taxes; neither have citizens or subjects been subjected to any new system of taxation, to carry on a work which all are willing to support.

Now, so far as the land is concerned, each government may obtain the ready and willing co-operation of its own citizens or subjects engaged observing as amateur meteorologists, and that too at a cost still more trifling than that by which the ocean has been brought regularly within the domains of meteorological investigation.

Every State in Christendom already has one or more meteorological observatories, from which published observations are issued to the world at occasional or stated intervals.

Now, should a universal system be adopted by these States, every government may procure amateur co-operation within its own borders to any extent, and at no greater cost than that of a printed copy of its observations to each one of its own citizens, who would provide himself, at his own expense, with the requisite instruments, and who would make the observations according to the prescribed form, and return them to the proper office for discussion and publication.

This is what the United States have done with regard to the observations at sea—two-thirds of the whole meteorological field of the earth.—There, the merchantmen are the amateurs; and by offering them, for their co-operation, a copy of the nautical works which their observations help to make, the ocean has become literally dotted with floating observatories, already fitted with instruments, and furnished with observers at private charge.

So, too, any required number of free volunteer co-laborers on the land, may be enlisted in this general field of research, merely by the offer, on the part of their government, to give them a copy of the published works which their observations may help to make.

These amateurs would not, in many cases probably, be able to furnish their observatories with complete sets of self-registering instruments; but as to the ordinary instruments there can be no doubt, and would be no difficulty.

Who shall take up this subject and become its champion?

My field is the sea; and though many of the observations made there suggest, in urgent terms, the importance which corresponding observations on shore, and concert among observers on the land, would be to us in our system of research, yet I am not clear as to the propriety of my taking any very active initiatory part with reference to the assembling of a general meteorological congress, for the purpose of devising a system of observations which, embracing both sea and land, shall be universal. I hope the matter will be taken up by abler and stronger hands by far than mine.

Returning from this review of a general conference among meteorologists, to the proceedings of the Brussels Conference, with regard to the form of an abstract log for merchantmen, it was understood that the powers of the Conference did not extend beyond men-of-war, and that the officers of the various navies therein represented were better judges than the Conference could be, as to what observations, and what part of the man-of-war log, the merchantmen of his country could or would undertake.

These principles and data were, however, laid down as indispensable, viz: 1. Every log of every

co-operating merchantman, whatever his flag, must give at the least, the longitude and latitude of the ship daily; the height of the barometer, and the readings of both the air and the water thermometer, not less than once a day; the direction and force of the wind three times a day, first, middle, and latter part; the variation of the compass occasionally; and the set of the current whenever encountered. 2. That these observations, to be worth having, must be accurately made, and that, as every thermometer or barometer has its sources of error, consequently every shipmaster, who undertakes hereafter to co-operate with us, and keep an abstract log, should have his barometer and thermometer accurately compared with standard instruments, the errors of which have been accurately determined.

These errors the master should enter in the log; the instruments should be numbered, and he should so keep the log as to show what instrument is in use. For instance, a master goes to sea with thermometers Nos. 4719, 1, 12, &c., their errors having been ascertained and entered on the blank page for the purpose in the abstract log. He first uses No. 12. Let it be so stated in the column of Remarks, when the first observation is recorded, thus: thermometer No. 12. During the voyage, No. 12 gets broken, or for some reason is laid aside, and another, say 4719, is brought into use. So state, when the first observation with it is recorded, and quote in the column of Remarks the errors both of Nos. 12 and 4719. Now, with such a statement of errors given in the log, for each of these instruments, according to its number, the observations may be properly corrected when they come up here for discussion.

It is as rare to find a barometer or a thermometer that has no error, as it is to find a chronometer without error. A good thermometer, the error of which the maker should guarantee not to exceed in any part of the scale 1°, will cost in the United States not less than $2, perhaps $2 50.

The errors of thermometers sometimes are owing to inequalities in the bore of the tube, sometimes to errors of division on the scale, &c. Therefore, in comparing thermometers with a standard, they should be compared at least for every degree between melting ice and blood heat.

The hours at which observations are most important, are denoted by large figures; and the columns which it is most important for merchantmen to fill up are marked, in the Brussels form, given in the abstract log; (*a*) for those which are indispensable; (*b*) for the next most important; (*c*) for the next, and so on.

We are now about to turn over a new leaf in navigation, on which we may confidently expect to see recorded much information that will tend to lessen the dangers of the sea, and to shorten the passage of vessels.

We are about to open in the volume of Nature, a new chapter, under the head of MARINE METEOROLOGY. In it are written the laws that govern those agents which the "winds and the sea obey." In the true interpretation of these laws, and the correct reading of this chapter, the planter as well as the merchant, the husbandman as well as the mariner, and States as well as individuals, are concerned. They have a deep interest in these laws. For, with the hygrometrical conditions of the atmosphere, the well-being of plants and animals is involved. The health of the invalid is often dependent upon a dry or a damp atmosphere, a cold blast or a warm wind.

The atmosphere pumps up our rivers from the sea, and transports them through the clouds to their sources among the hills; and upon the regularity with which this machine, whose motions, parts, and offices we now wish to study, lets down that moisture, and the seasonable supply of rain which it furnishes to each region of country, to every planter, and upon all cultivated fields, depend the fruitfulness of this country, the sterility of that.

The principal maritime nations, therefore, have done well by agreeing to unite upon one plan of observation, and to co-operate with their ships on the high seas with the view of finding out all that patient research, systematic, laborious investigation may reveal to us concerning the winds and the waves.

Accordingly, every one who uses the sea is commanded or invited to make certain observations; or, in other words, to propound certain queries to Nature, and to give us a faithful statement of the replies she may make.

Now, unless we have accurate instruments, instruments that will themselves tell the truth, it is evident that we cannot get at the real meaning of the answers that Nature may give us.

An incorrect observation is not only useless of itself, but, when it passes undetected among others that are correct, it becomes mischievous; for it vitiates results that are accurate, places before us wrong premises, and thus renders the good of no value.

With this explanation to gallant American shipmasters co-operating with me, the results of whose labors are seen in the works of this office, I appeal to their spirit and pride, and leave it for each one to decide what additional instruments he will take with him to sea; what columns of the new log he will undertake to fill, and at what other than the usual hours he will observe.

I leave this to their intelligence and judgment, in the full confidence that, when the next maritime conference meets to compare notes, and discuss new points, he who has the honor to represent our country there, will not be ashamed to lay the contributions of the American merchant marine before the meeting, or to see them compared with the best offerings from other flags.

And that each one may have it in his power to contribute according to his inclination and ability, I have given, on pages 192, 193 of this work, the form of the man-of-war log; and under it, on the same two pages, the form of the abstract log for the merchant service. I call this the "Log for the Merchant Service," because the observations called for in it are a *minimum*. Every merchant captain who wishes to co-operate with us, must furnish at least what the blanks of that form call for, in order that he may be entitled to the Charts, and these Sailing Directions.

There are many clever men in the merchant service who have been co-operating with me from the beginning; and there are many more who are ready, willing, and competent to give all the information that the most complete man-of-war abstract calls for. To all such, I shall be most happy to furnish man-of-war blanks.

Abstracts according to this form are wanted for all parts of the ocean, and for every sea, and particularly for the China Seas, and the Indian and Pacific Oceans.

There is a promise of much activity among friends in the East Indies upon this subject, and of

many valuable contributions for the construction of charts independently of what American shipmasters may furnish for me. In 1851, a meteorological society was established at the Mauritius, under the especial patronage of the enlightened Governor, Mr. Higginson, and with the indefatigable Meldrum for secretary. This Society is rendering most important services to the cause; it is avowedly co-operating with us, and it makes it a regular part of its duties to collect the abstract logs of vessels arriving at that important meteorological station.

Since 1839, Piddington has been at work in Calcutta, almost solitary and alone, till now. He has, however, collected a vast amount of information concerning storms, from which his cyclonology has sprung.

At Madras, there is a well-founded meteorological observatory under the charge of Major Jacob, an officer of distinguished merit and high attainments.

Sir Henry Pottinger, and Dr. Ford, the meteorologist, are also in India. Their previous history is a guarantee of sympathy and support from them, in any undertaking to advance science and the good of mankind.

Mr. Fergusson, an officer of the Indian Navy, in charge of the Bombay Observatory, is engaged in collecting materials for, and in the construction of, a set of wind and current charts for the Indian Ocean.

A great step has already been accomplished towards "uniformity" of observations by placing within the reach of co-operators at sea good and accurate instruments, especially barometers and thermometers. Through the kindness and industry of the Kew Committee of the British Association this has been done; and, as it is a matter of interest to those who are laboring in this field, I quote a letter from Mr. Gassiot upon the subject:—

LONDON, *July* 18, 1854.

SIR: I am directed by the Kew Committee of the British Association to acquaint you that, after much consideration, they have decided on the barometer which they consider most applicable for marine observations, and that those ordered by Mr. Stevens for the use of the U. S. Navy are of that construction.

In selecting the form of marine barometer best adapted to the purpose of making observations at sea, the Committee have endeavored to combine convenience and economy with accuracy, durability, and simplicity in construction and adjustment.

The barometer proposed by Mr. Adie appears to them to fulfil those conditions in a satisfactory manner. Its action at sea has been tested, under their superintendence, by Mr. Welsh,* on two occasions, once in a voyage to Leith and back, and subsequently to the Island of Jersey. The general conclusion arrived at in those trials is that, in order to reduce the pumping of the mercury within convenient limits, it is necessary to have the tube contracted to such an extent, that the mercury will take about twenty minutes to fall from the top of the tube to the height indicating the true pressure of the atmosphere at the time. From comparisons made at Kew with the standard there, it has been found

* I am indebted also to Mr. Welsh for comparing with the Kew standard many hundred thermometers for the navy, none of which have an error exceeding half a degree ($\pm$ 0°.5) in any part of the scale; generally, their maximum amount of error does not amount to half that quantity.

that, owing to this contraction in the tube, the absolute freedom of the mercury is to a small extent interfered with, as the motion of the mercury in the standard barometer is always a little in advance of the marine barometer; that is, when the mercury is rising from increasing pressure of the atmosphere, the marine barometer is a little lower than the standard; and on the contrary, when the mercury is falling, the marine barometer is a little higher. The amount of this retardation is, however, very small—something less than one hundredth of an inch, and, from its being in opposite directions in a rising and falling barometer, will produce no error in the *mean* height of the barometric column; it will, however, to some extent, mask the smaller changes, such as the hourly variation. It should be remarked, however, that the motion of the ship will always tend to diminish the amount of the retardation, and it is believed will, in general, nearly destroy it.

The instrument is constructed by Mr. Adie, of 395 Strand. The price, including cost of packing-case, ten shillings for verification at the Kew Observatory, carriage there and subsequent delivery in London, will be £3 15*s.* 6*d.*, at which price Mr. Adie is prepared to supply any quantity that may be required.

I have the honor to be, sir, your obedient servant,

(Signed) JOHN P. GASSIOT,

Chairman of the Kew Committee, British Association.

I recommend, therefore, Mr. Adie's MARINE BAROMETER OF KEW, to all shipmasters who are co-operating with me, and who desire to have a really *good* marine barometer—one, the observations with which will be truly valuable, because being made with an accurate instrument, they may be compared with the observations of other standard barometers in all parts of the world, whether ashore or afloat. For such a purpose, observations with the *common* marine barometer are worth comparatively little; and *observations with the* ANEROID, "next to nothing." Therefore, when an Adie or Green's "Mountain Marine," of New York, equally good, is used, please note its facts at the beginning and end of the abstract log for every voyage.

Col. Sabine, of the Royal Engineers, as well as the Kew Committee, has been very kind with his powerful aid in behalf of our labors, by assisting me in procuring proper instruments, and in lending a hand in many kind ways. I am indebted also to Mr. Glaisher, of the Greenwich Observatory, to Mr. Welsh, of Kew, and to many other gentlemen in England, for kind services and friendly aid.

The makers who have furnished the best and cheapest thermometers which have fallen under my observation, are Mr. James Green, 422 Broadway, New York, and Messrs. Negretti & Zambra, 11 Hatton Garden, London; Green furnishes also the hydrometers for the navy. None of the thermometers of either of these makes that have fallen under my observation, have errors exceeding a fraction of one degree.

An Institute for the discussion of observations made by the Dutch Marine has been established at Utrecht, under the direction of Prof. Ballot. He was assisted by Lieut. Jansen, of the Dutch Navy, who was most zealous in the cause. I regret to learn that this officer has been relieved of this duty, for he was a most accomplished navigator, and had displayed both zeal and ability in the good cause; Lieut. Van Gogh succeeds him. This Institute has gone to work in a very thorough and business-like way. It is the oldest of those in Europe that are co-operating with us. Lieut. Jansen writes:—

"During the time I have been in office, there have been distributed 102 sets of Wind and Current Charts to Dutch vessels, all of which had all the instruments compared with standards on board, as recommended by the Brussels Conference, and ready to keep the man-of-war log.

"Most of them are bound to Australia and Java. At Amsterdam, Rotterdam, Dordrecht, and Groningen, there are commissioners of ship owners and shipmasters to look that the ships who receive Charts have the required instruments on board, and compare those with the standards.

"At Neu-deep, Helvoetsluys, and Flessingen there are standard barometers. At noon, with the time-signal, the reading of the reduced standard barometer is put at the harbor master's office, for comparison.

"Every month in winter we have public meetings to promote the researches upon the ocean, and twice a week all the shipmasters are invited to the Zeeman's Hoop, to receive there explanation and instruction of the Wind and Current Charts, or abstract log."

In England, a Wind and Current Bureau has been established in the marine department of the Board of Trade. Capt. Fitz Roy has the special charge of it—a sure guarantee that good work is to be done there; for he is already well and favorably known in the nautical world both as a navigator and hydrographer, and is distinguished for the good services he has rendered the cause of navigation by his admirable charts of Cape Horn and other portions of the world. The Wind and Current Charts, with Sailing Directions, are sent to this department in the Board of Trade for distribution among British shipping.

Sweden, Norway, and Denmark, have each also provided for giving the abstract logs kept on board their vessels, both commercial and naval, a discussion; and they, too, no doubt, will from time to time let the commercial world have the benefit of whatever useful results may be developed.

Dr. G. J. A. D. Pegado is at the head of the Wind and Current Bureau in Portugal. He has displayed both energy and zeal in organizing it, and preparing standard instruments for the ships that sail under that flag.

Spain, also, is at work in the same way. The Free City of Hamburg, and the Republic of Bremen have each taken steps to have the abstract logs furnished by their vessels properly disposed of, and the results contributed to the common fund of nautical information which has already been developed by these researches. The progress, therefore, that has been made with this joint work is exceedingly satisfactory, and the future is full of promise; and I hope those who have been sending their observations to me will derive encouragement from the statement.

THE TRACK CHARTS.

The Charts, numbered series A, are the *Track Charts.* Charts of this letter have been published for the North Atlantic, in eight large sheets; for the South Atlantic, in six; for the North Pacific sheets, six, seven, eight, nine, ten, and eleven; for the South Pacific sheets five and ten, and for the Indian Ocean sheets four and five. The remaining number of this series, both for the Indian and Pacific Oceans, are in process of construction. They are all on a scale of 0.8 in. to a degree at the equator.

The different sheets of this series show at a glance the frequented and unfrequented parts of the ocean;

they inform the navigator as to the general character of the wind and weather, the force and direction of the currents encountered by those who have preceded him in the same part of the ocean, and at the same season of the year.

This series, as far as published, is the work of Lieutenants Whiting, Porter, Wyman, Balch, Gibbon, Beaumont, Temple, and Woolley; and of Professors Flye and Benedict, all of the navy.

THE TRADE-WIND CHARTS.

The Charts of the series, marked letter B, are illustrative of the trade-winds and the regions of calms and monsoons contiguous thereto. They are constructed according to a peculiar system of engraved squares.

This series, published only for the Atlantic, shows that the N. E. trade-winds occupy a belt or zone extending in length from east to west across that ocean, having a variable breadth of from 17° to 35° of latitude. Its average mean breadth is about 23°; and in its extreme range, it extends from 3° south to 35° north, according to the season of the year.

This zone makes two vibrations in a year. It reaches its extreme northern declination usually in September. Then returning, and following the sun, it reaches its southern extreme in March and April. Being stationary for two or three months, between 3° and 4° north, it commences to return north, and in the months of August, September, and October, its other stationary period, it is seldom or never found to the south of the parallel of 9° N. The parallel of 9° N. may be taken as the mean limit of the equatorial border of the zone of N. E. trades.

The S. E. trade-winds occupy a similar zone in the South Atlantic, with a like vibratory motion. The mean equatorial limit of this zone, instead of being near the parallel of 9° south, to correspond with the zone of the northern hemisphere, is in about 3° north.

It is a remarkable phenomenon, discovered in the course of these investigations, that the S. E. trade-winds blow with more force than do their congeners of the northern hemisphere. They have force enough to push the latter with their belt back towards the north, intruding occasionally in the late summer, and in the early fall months, as far as the parallel of 9° north. Whereas, out of many thousands of records examined, it does not appear that the belt of N. E. trade-winds is ever found to cross the parallel of 3° south.

The two zones of winds are characterized by a like difference of strength in the Pacific. The S. E. trade-winds of the Atlantic Ocean have force enough to push their equatorial limits over into the northern hemisphere, and to maintain them there during the greater part of the year. The reverse is never the case; the N. E. trades have not the force to crowd out the S. E. trades, and to maintain themselves for any month of the year in the southern hemisphere.

The prevailing direction of what are called the N. E. trade-winds is, as nearly as the observations which mariners usually furnish enable me to determine, about E. N. E.

By resolving the forces which it is supposed are the principal forces that put those winds in motion, viz: calorific action of the sun and diurnal rotation of the earth, we are led to the conclusion that the latter is much the greater of the two in its effects upon the trade-winds of the northern hemisphere. But not to such an extent is it greater in its effects upon those of the southern. We have seen that those two opposing currents of wind are so unequally balanced that one recedes before the other, and that the current from the southern hemisphere is larger in volume; *i. e.* it moves a greater zone or belt of air. The S. E. trade-winds discharge themselves over the equator—*i. e.* across a great circle—into the region of equatorial calms; while the N. E. trade-winds discharge themselves into the same region over a parallel of latitude, and consequently over a small circle. If, therefore, we take what obtains in the Atlantic as the type of what obtains entirely around the earth, as it regards the trade-winds, we shall see that the S. E. trade-winds keep in motion more air than the N. E. do, by a quantity at least proportioned to the difference between the circumference of the earth at the equator and the circumference of the earth at the parallel of latitude of 9° N. For if we suppose that those two perpetual currents of air extend the same distance from the surface of the earth, and move with the same velocity, a greater volume from the south would flow across the equator in a given time than would flow from the north over the parallel of 9° in the same time; the ratio between the two quantities would be as rad. to the sec. of 9°. Besides this, the quantity of land lying within and to the north of the region of the N. E. trade-winds is much greater than the quantity within and to the south of the region of the S. E. trade-winds. In consequence of this, the mean level of the earth's surface within the region of the N. E. trade-winds is, it may reasonably be supposed, somewhat above the mean level of that part which is within the region of the S. E. trade-winds. And as the N. E. trade-winds blow under the influence of a greater extent of land surface than the S. E. trades do, the former are more obstructed in their course than the latter, by the forests, the mountain ranges, unequally heated surfaces, and other such like inequalities.

As already stated, the Charts show that the momentum of the S. E. trade-winds is sufficient to push the equatorial limits of their northern congeners back into the northern hemisphere, and to keep them at a mean, as far north as the 9th parallel of north latitude. Besides this fact, our investigations also indicate that while the N. E. trade-winds, so called, make an angle, in their general course, of about 23° with the equator (E. N. E.), those of the S. E. make an angle of 30° or more with the equator (S. E. by E.). I speak of those in the Atlantic; thus indicating that the latter approach the equator more directly in their course than do the others, and that, consequently, the effect of the diurnal rotation of the earth being the same for like parallels, north and south, the calorific influence of the sun exerts more power in giving motion to the southern than to the northern system of Atlantic trade-winds.

That such is the case in nature is rendered still more probable from this consideration: All the great deserts are in the northern hemisphere, and the land surface is also much greater on our side of the equator. The action of the sun upon these unequally absorbing and radiating surfaces in and behind, or to the northward of the N. E. trades, probably tends to retard these winds, and to draw large volumes of the atmosphere, that otherwise would be moved by them, back to supply the partial vacuum made by the heat of the sun—as it pours down with active intensity, its rays upon the vast plains of burning sands and

unequally heated land surfaces—in our overheated hemisphere. The N. W. winds of the southern are stronger than the S. W. winds of the northern hemisphere.

The Charts show that the influence of the land upon the normal directions of the wind at sea, is an immense influence. It is frequently traced for a thousand miles or more out upon the ocean.

For instance: The action of the sun's rays upon the great deserts and arid plains of Africa, in the summer and autumnal months, is such as to be felt nearly across the Atlantic Ocean, between the equator and the parallel of 13° north. Between this parallel and the equator, the trade-winds are turned back by the heated plains of Africa, and are caused to blow a regular southwardly monsoon for six months.

This monsoon is a discovery which has been fully and completely developed by the Charts and the investigations connected with them. They (the monsoons) blow towards the coast of Africa, from June to November, inclusive. They bring the rains which divide the season in these parts of the African coast. The region of the ocean embraced by the monsoons is cuneiform in its shape, having its base resting upon Africa, and its apex stretching over till within 10° or 15° of the mouth of the Amazon.

Indeed, when we come to study the effects of South America and Africa (as developed by these Charts), upon the winds at sea, we should be led to the conclusion—had the foot of civilized man never trod the interior of these two continents—that the climate of one is humid; that its valleys are for the most part covered with vegetation, which protects its surface from the sun's rays; while the plains of the other are arid and naked; and for the most part act like furnaces, in drawing the winds from the sea to supply air for the ascending columns which rise from its overheated plains.

Pushing these facts and arguments still farther, these beautiful and interesting researches seem already sufficient almost to justify the assertion, that, were it not for the Great Desert of Sahara, and other arid plains of Africa, the western shores of that continent within the trade-wind region would be almost, if not altogether, as rainless and sterile as the desert itself.

These investigations, with their beautiful developments, eagerly captivate the mind; giving wings to the imagination, they teach us to regard the sandy deserts, and arid plants, and the inland basins of the earth, as compensations in the great system of atmospherical circulation. Like counterpoises to the telescope, which the astronomer regards as incumbrances to his instrument, these wastes serve as make-weights, to give certainty and smoothness of motion—facility and accuracy to the workings of the machine.

The meteorological and physical researches with which the Wind and Current Charts are connected, relate only to the sea. Already, the mariner has felt and acknowledged the importance of them. Commerce and navigation are reaping benefits from them of great moment. The merchants of Bombay, and American navigators, with that regard for the practical and useful which adorns their character and makes them renowned, were the first to come forward, and volunteer to co-operate with me in collecting facts for the farther prosecution of the work. Nations owning nine-tenths of all the shipping in the world—indeed, I might say every maritime nation of any consequence, except France, are now engaged in this work; so that more than a thousand ships are daily and hourly occupied in all parts of the ocean in making and recording, each a prescribed series of observations upon the winds and the currents, the rains, the calms,

the storms, the thunder and the lightning; the fogs, and clouds, and drift—the temperature of the air and water; and all other subjects and objects, facts and phenomena, which are of interest to navigation and to science.

Enough of abstract logs has already been collected at this office to make about four hundred large folio volumes, averaging each from two to three thousand days' observations, and the number is constantly increasing; indeed, the materials increase faster than I have force to discuss them.

When we travel out upon the ocean, and get beyond the influence of the land upon the winds, we find ourselves in a field particularly favorable for studying the general laws of atmospherical circulation.

Here, beyond the reach of the great equatorial and polar currents of the sea, there are no unduly heated surfaces, no mountain ranges, or other obstructions to the circulation of the atmosphere; nothing to disturb it in its natural courses. The sea, therefore, is the field for observing the operations of the general laws which govern the atmospheric circulation. Observations on the land will enable us to discover the exceptions. But from the sea we shall get the rule. Each valley, every mountain range and local district, may be said to have its own peculiar system of calms, winds, rains, and droughts. But not so the surface of the broad ocean.

In this connection, I beg leave to call the attention of meteorologists on shore to the importance of introducing a special column in their journals, to show what are the rainy winds at each station, and for each season of the year.

Upon every water-shed which is drained into the sea, the precipitation may be considered as greater than the evaporation for the whole extent of the shed so drained, by the amount of water which runs off into the sea. In this view, all rivers may be regarded as immense rain-gauges; and the volume of water annually discharged by any one, as an expression of the quantity which is annually evaporated from the sea, carried back by the winds, and precipitated throughout the whole extent of the valley that is drained by it. Now, if we knew the rain winds from the dry, for each locality and season generally throughout such a basin, we should be enabled to determine, with some degree of probability, at least, as to the part of the ocean from which such rains were evaporated. And thus, notwithstanding all the eddies caused by mountain chains, and other uneven surfaces, we might detect the general course of the atmospherical circulation over the land as well as the sea, and make the general courses of circulation in each valley as obvious to the mind of the philosopher as is the current of the Mississippi, or of any other great river, to his senses. That river so abounds with eddies, that it is difficult to tell by regarding small portions of its surface only, which way the water is flowing. But when we come to regard the drift-wood and the whole river, we are left in no doubt as to the onward course of the main stream itself, with all its eddies and whirlpools.

These investigations as to the winds at sea indicate that the vapors which supply the sources of the Amazon with rain, are taken up from the Atlantic Ocean by the N. E. and S. E. trade-winds.

These investigations show that the trade-wind regions of the ocean, beyond the immediate vicinity of the land, are, for the most part, rainless regions; and that the trade-wind zones may be described, in an hyetographic sense, as the evaporating regions.

They also show, or rather indicate as a general rule, that, leaving the polar limits of the two trade-wind systems, and approaching the nearest pole, the precipitation is greater than the evaporation, until the point of maximum cold is reached.

They also indicate, as a *general* rule, that the S. E. and N. E. trade-winds which come from a lower and go to a higher temperature, are the evaporating winds, *i. e.* they evaporate more than they precipitate; while those winds which come from a higher and go to a lower temperature, are the rain winds, *i. e.* they precipitate more than they evaporate. That such is the case, these Charts indicate; reason teaches it to us; and philosophy tells us it is so.

The results of these Charts, therefore, suggest the inquiry as to the sufficiency of the Atlantic, after supplying the sources of the Amazon, and its tributaries with their waters, to supply also the sources of the Mississippi and the St. Lawrence, and of all the rivers, great and small, of North America and Europe.

A careful study of the rain winds, in connection with the Wind and Current Charts, will probably indicate to us the "springs in the ocean," which supply the vapors for the rains that are carried off by those great rivers.

"All the rivers run into the sea; yet the sea is not full; unto the place from whence the rivers come, thither they return again."

Returning now to the trade-winds of the Atlantic: there is, between the two systems, a region of calms, known as the equatorial calms. It has a mean average breadth of about six degrees of latitude. In this region, the air, which is brought along to the equator by the N. E. and S. E. trades, ascends.

If we liken the belt of equatorial calms to an immense atmospherical trough, extending, as it does, entirely around the earth, and if we liken the N. E. and S. E. trade-winds to two streams discharging themselves into it, we shall see that we have two currents perpetually running in at the bottom; and that, therefore, we must have as much air as the two currents bring in at the bottom, to flow out at the top. What flows out at the top is carried back north and south, by these upper currents, which are thus proved to exist and to flow counter to the trade-winds.

Using still further this mode of illustration: if we liken the calm belt of Cancer, and the calm belt of Capricorn, each to a great atmospherical trough extending around the earth also, we shall see that, in this case, the currents are running in at the top and out at the bottom; here the current from the equator meets, in the upper regions, the current from the poles; the two descend; and the atmosphere, which they thus pour into these belts, runs out at the bottom—on one side towards the equator, as the perpetual trade-winds; on the other, towards the poles, as the prevailing winds of the regions between these belts and the polar circles.

The belt of equatorial calms is a belt of constant precipitation. Captain Wilkes, of the Exploring Expedition, when he crossed it in 1838, found it to extend from 4° N. to 12° N. He was ten days in crossing it, and during those ten days, rain fell to the depth of 6.15 inches, or at the rate of 18 feet and upwards during the year.

This belt of calms vibrates up and down the ocean as the belts of the trade-winds do. In the summer

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months it is found between the parallels of 8° and 14° of north latitude, and in the spring between 5° S. and 4° N.

By this Chart, the navigator can tell what places within the range of this zone, have, during the year, two rainy seasons, what one, and what are the rainy months for each locality.

Were the N. E. and the S. E. trades with the belt of equatorial calms of different colors, and visible to an astronomer in one of the planets, he might, by the motion of these belts or girdles alone, tell the seasons with us.

He would see them at one season going north, then appearing stationary, and then commencing their return to the south. But though he would observe that they follow the sun in his annual course, he would remark that they do not change their latitude, as much as the sun does his declination; he would, therefore, discover that their extremes of declination are not so far asunder as the tropics of Cancer and Capricorn, though in certain seasons the changes from day to day are very great. He would observe that these zones of winds and calms have their tropics or stationary nodes, about which they linger nearly three months at a time; and that they pass from one of their tropics to the other in a little less than another three months. Thus, he would observe the whole system of belts to go north from the latter part of May till some time in August. Then they would stop and remain stationary till winter, in December; when again they would commence to move rapidly over the ocean, and down towards the south, until the last of February or the first of March; then again they would become stationary, and remain about this, their southern tropic, till May again.

The zone of the S. E. trade-winds would present to him its northern edge inclined somewhat to the equator; commencing near the coast of Africa, and tracing the usual outlines of this edge over towards South America, he would discover that it approached the equator at an angle of about 18°; and our supposed astronomer would announce that the equatorial edge of the zone of S. E. trades in the Atlantic is inclined towards the equator at an angle of 15°—that it lies W. 15° N., and E. 15° S.

Turning his attention now to the belt of N. E. trade-winds, he would observe the equatorial edge of this zone to be somewhat, though not altogether, symmetrical with the equatorial edge of the S. E. trade-wind zone of the other hemisphere. On the African side it is farthest from the equator, which it approaches at an angle of about 10° (W. by S.), until it reaches the meridian of about 40° west. Here it is deflected to the north, and trends off in the direction of W. N. W. Here we begin to experience the effect of the North American continent upon the trade-winds at sea. The rarefaction caused by the lands of Northern Texas and the arid plains in that quarter, is sufficient in summer to convert the N. E. trades of the Gulf of Mexico into a prevailing wind from the southward and eastward.

In the Pacific, and within a certain distance from the land, the N. E. trade-winds are, by the same influences, as these researches into the winds and currents of the sea have revealed, converted into a southerly monsoon.

By tracing on a chart the equatorial limits of the N. E. and S. E. trade-winds, as herein described, it will be perceived that there is left between the two systems a wedge-shaped band, having its broadest part on the African side of the Atlantic. The region of the ocean which the planetary astronomer would

observe this band or belt to cover, is the region which is occupied by the equatorial calms and the African monsoons that fall between the systems of N. E. and S. E. trade-winds. And were the belt which represents these calms different from the rest as to color, the imaginary astronomer would see it as somewhat of an irregular curve, not having the northern and southern edges concentric. The concave side of this curved belt is turned to the E. of N., and has its centre near the shores of Greenland.

As before remarked, the newly discovered monsoons of the North Atlantic Ocean also come within the belt of equatorial calms. They give the peculiar wedge-shaped form to the regions between the two systems of trade-winds.

Having completed the physical examination of the equatorial calms and winds, if the supposed observer from some distant sphere should now turn his telescope towards the poles of our earth, he would observe a zone of calms bordering the N. E. trade-winds on the north, and another bordering the S. E. trade-winds on the south. These calm zones also would be observed to vibrate up and down with the trade-wind zones—partaking of their motions, and following the declination of the sun.

On the polar side of each of these two calm zones there would be a broad band extending up into the polar regions, the prevailing winds within which are the opposites of the trade-winds, viz: S. W. in the northern and N. W. in the southern hemisphere.

The equatorial edge of these calm belts is near the tropics, and their average breadth is 10° or 12°. On one side of these belts the winds blow perpetually towards the equator; on the other, their prevailing direction is towards the poles.

These belts, therefore, may also be considered as nodes in the general system of atmospherical circulation.

The atmosphere, which the N. E. and S. E. trade-winds keep in perpetual motion towards the equator, has for its node the equatorial calms. Here it ascends, boils over, divides, and flows off in the upper regions of the atmosphere, one part going to the northern, the other to the southern hemisphere, to complete the "circuit of the winds," and to supply the sources of the trade-winds with air.

Arrived near the Tropic of Cancer, the northern currents meet, in the upper regions of the atmosphere, the return current, which the prevailing winds of the north temperate zone have carried, as a surface current, to the hyperborean regions of the north. These two currents produce another node or calm region, in which the atmosphere descends, and from which it issues both to the north and the south, assuming, on one side, the character of N. E. trades; on the other, the character of the S. W. passage winds.

This node has its fellow in the southern hemisphere, where there is a like meeting of upper currents; only from one side of the zone of the calms of Capricorn, the wind issues as the S. E. trades; from the other as the N. W. passage winds of that part of the southern hemisphere which is extra-tropical. See Plate II., in which the two outer lines, marked A, B, and so on, are drawn to represent the vertical, and the arrows on the shaded ground the horizontal, motion of the atmosphere.

Along the polar borders of these two calm belts, we have another region of precipitation, though generally the rains here are not so constant as they are in the equatorial calms. The precipitation near

the tropical calms is nevertheless sufficient to mark the seasons; for, whenever these calm zones, as they go from north to south with the sun, leave a given parallel, the rainy season of that parallel, if it be in winter, is said to commence. Hence, we may explain the rainy season in Chili at the south, and in California at the north.

This letter of the series of the Charts will enable any one who consults it, to tell to what places the tropical calms bring rain, and in what months the rainy season commences and ends, for any parallel.

To complete the physical examination of the earth's atmosphere, which we have supposed an astronomer in one of the planets to have undertaken, according to the facts developed by the Wind and Current Charts, it remains for him to turn his telescope upon the icy regions of the poles. (For that *we* should complete the examination in this respect, it would be necessary to obtain the log-books of ships in the anti-commercial regions of the ocean, which we cannot do. As the sea is most open near the south pole, the principle of the general law of atmospherical circulation would be better developed probably by observations in the antarctic, than in the arctic regions.)

For the want of such observations, but with the light which these Charts throw on the subject for our guide, let us pursue the S. W. passage winds of the northern hemisphere into the arctic regions, and see theoretically, with the imaginary telescope, how they get there; and, being there, what becomes of them.

From the parallel of 40° up towards the north pole, the prevailing winds in the northern hemisphere, as already remarked, are the S. W. passage winds, or, as they are more generally called by mariners, the "westerly" winds; these, in the Atlantic, prevail over the "easterly" winds, in the ratio of about two to one.

Now, if we suppose, and such is probably the case, these "westerly" winds to convey in two days a greater volume of atmosphere towards the arctic circle than those "easterly" winds can bring back in one, we establish the necessity for an upper current by which this difference may be returned to the tropical calms of our hemisphere. Therefore, there must be some place in the polar regions at which these S. W. winds cease to go north, and from which they commence their return to the south, and this locality must be in a region peculiarly liable to calms. It is another atmospherical node in which the motion of the air is upward, with a decrease of barometric pressure. It is marked P, Plate II.

If we now return to the calm belt of the northern tropic, and trace theoretically a portion of air that, in its circuit, shall fairly represent the average course of these S. W. passage winds, we shall see that it approaches the pole in a loxodromic curve; that as it approaches the pole it acquires, from the spiral convolutions of this curve which represents its path, a whirling motion, in a direction *contrary* to that of the hands of a clock; and that the portion of atmosphere whose path we are following, would gradually contract its gyrations, until it would finally ascend, turning against the hands of a watch, as it whirls around.

After reaching the upper regions of the atmosphere, through this whirl, its course would be to the southward; or rather, owing to the effect of the axial rotation of the earth, its course would be from the northward and eastward, until it should meet also in the upper regions a like portion from the ascending

node, formed in the calms near the equator. This meeting in the upper regions of the atmosphere, as already remarked, takes place in the zone of the calms of Cancer. Here the two currents, the one from the poles, the other from the equator, balance each other, produce a calm, or the descending node for the northern hemisphere, with an increase of barometric pressure.

In the southern hemisphere a like process is going on; only there, the N. W. passage wind would, as it arrives near the antarctic calms, acquire a motion with the sun, or in the direction of the hands of a watch.

That such is the case, the investigations that are carried on here do not prove; but they, and a process of reasoning guided by analogy, derived from what they do show, suggest that such is *probably* the case.

The general course of the circulation of the atmosphere, as partly established and partly suggested by these researches and other sources of information, is an upper current from the poles, as far as the tropical calms, towards the equator; thence a descent and a surface current (N. E. and S. E. trades), to the equatorial calms. Here an ascent takes place, through which air is supplied for an upper current each way towards the poles, as far as the zone of tropical calms. Here there is a descent, and a continuation towards the polar regions as a surface current (S. W. passage winds in the northern, N. W. in the southern hemisphere), until it approaches, in part, the calms of the arctic and antarctic regions. Here it commences to whirl about in the manner already stated, forming the supposed polar calms, in which it ascends, and so commences its return towards the equator by reversing the circuit just described. (*Vide* Plate II.).

The following is a part of the history connected with these investigations as to the circuit of the winds: *Extract from a letter to the Prussian Minister, Baron Von Gerolt, dated, National Observatory, June* 20, 1850.

Speaking in advance somewhat of my publication, but leaning, nevertheless, upon the indications already given by the investigations which are in progress at this office with regard to the winds and currents of the sea, and the phenomena connected therewith, I may remark that certain conclusions have been forced upon me, with such verisimilitude, that it only remains for Professor Ehrenberg, with his microscope, to write the final Q. E. D. to them.

For instance, my investigations of the winds at sea, so far as they bear upon the subject, seem to indicate that the rivers and fresh water of the northern, temperate, and frigid zones, are, for the most part, evaporated from the south torrid; or, more properly speaking, that they are taken up from the sea by the S. E. trade-winds. Such, at least, is the indication; and certain facts so tend in their bearings, as to convert this indication into a conclusion that does not appear altogether forced.

As a general rule, most of the land is in the northern, and most of the water in the southern hemisphere. But, notwithstanding the absence of evaporating surface in the northern hemisphere, most of the precipitation takes place there, if we regard the waters that are discharged into the ocean by the rivers as an expression of the excess of the precipitation over the evaporation that takes place in the basins drained by these rivers. The basin of the Amazon is in both hemispheres; it is, therefore, common, and should

not be counted as peculiar to either. The Rio de la Plata is the only great river, then, in the southern hemisphere; whereas, in the northern, are all the rivers, great and small, which give drainage to Europe, Asia, and America.

The question then comes up: Does the Atlantic afford evaporating surface sufficient to supply all the rivers of Europe and America with rain water? and, if so, by what winds do the vapors, that make these rains, travel both east and west from the same place?

Very little of America and no part of Europe is within the region of the N. E. trade-winds; and the trades, because they come from a colder and go to a warmer climate, are eminently evaporating winds. But how is it to the north of the N. E. trade-winds, where, on the surface of the earth, the S. W. are the prevailing winds? Here, as a general remark, the winds are going from a warmer to a colder climate, and, therefore, ought, it would seem, to precipitate more than they evaporate. Thus, take the isotherm of 60° Fahr. in the Atlantic, as an example; the mean dew-point, we will suppose, along this line, is between 50° and 60°, or at any other degree below 60°—suppose 55°—that we may choose for the illustration.

Now, let us proceed still farther north in this ocean, until we reach the isotherm of 30°; on this line the mean dew-point must be below 30°, how much we cannot say, nor is it material for the illustration that we should say. It is certainly below the mean dew-point of 60°. Now, what becomes of the vapor that has caused the mean dew-point of the isotherm of 60° to change to that which belongs to the isotherm of 30°? It has been precipitated, and the capacity of the air to retain moisture has been lessened proportionably. In thus viewing the case, the question arises: Whence are the vapors taken, which supply with rain the sources of the rivers of the north temperate and frigid zones?

You will understand me as speaking in general terms, without regard to any of the exceptions caused by anomalies, such as the Gulf Stream and the like.

Where the N. E. and S. E. trade-winds meet, they produce what is known as the belt of equatorial calms. This is one of the valves in the great atmospherical machine, through which the air that is brought from the north and the south by these trade-winds, rises and escapes into the upper regions of the atmosphere, and thence returns to supply the sources of the trades with fresh air to make more winds of.

Now the question is: Does the air which is brought to this valve by the S. E. trades continue on towards the north, in the upper regions of the atmosphere; while that which comes down as the N. E. trades, continues on towards the south, in like manner? or does the air which the S. E. trades bring to this calm place, rise up and return to the south? or does the air of the two trades intermingle here, and go, a part of it indiscriminately, either to the north or to the south as chance may determine?

I am inclined to favor an affirmative reply to the first of these interrogatories; and for these reasons, in addition to those already alluded to:—

1. Winter, late fall, and early spring, are the seasons of our greatest precipitation; and this is the time when the sun is pumping up the vapor with the greatest energy from the southern, and with the least from the northern oceans—and so too when the sun is pumping up vapor from the northern hemisphere with all his energies, precipitation is most active in the southern.

2. The belt or band over which the S. E. trades prevail is much broader than that over which the N. E. trades prevail; consequently, supposing the velocity of each trade-wind to be the same, or nearly the same, the S. E. trade takes up more moisture, because it sweeps over a broader belt of ocean; and sweeping over a broader belt, it remains longer in contact with the evaporating surface; and consequently, it may be supposed, it brings more moisture to the belt of equatorial calms whence the ascent takes place.

A large portion of this moisture is deposited in the equatorial calms, which we know is a region of constant precipitation. But where is the rest precipitated—in the northern or southern hemisphere? In the former, I suppose; because the rivers and the rain-gauge as far as it has been observed, tell us that the total amount of precipitation in the northern, is greater than that in the southern hemisphere; indeed, it is not necessary to consult the rain-gauge to learn this; the rivers themselves are sufficient rain-gauges for this purpose; for we have only to consider the volume of water annually discharged into the ocean by northern rivers, to see in it an expression for an amount by which the total precipitation is in excess of the total evaporation which takes place in the whole extent of valleys drained by such rivers. Search the southern hemisphere for a like quantity, and the search will be in vain.

Seeing, moreover, that the southern hemisphere has more water and less land than the northern; that it has less rain and fewer rivers, it seems as though, in likening the atmosphere to an immense machine, we might call the southern seas the boiler, and the northern continent the condenser, for the mighty engine.

There is, perhaps, another point upon which an argument, not altogether without plausibility, may be turned in favor of this hypothesis.

The grounds for this argument are drawn from probability, and the argument itself rests on the degree of belief and faith we have in the perfection of terrestrial adaptations.

To state the argument in this point of view, we must consider the atmosphere, not only as a great condensing machine, but as an immense sewer, in which vast quantities of corrupt animal and vegetable matter are continually being cast for re-elaboration, purification, re-arrangement, and re-adaptation to the purposes of the animal and vegetable kingdoms.

Notwithstanding the quantity of matter that the plants and animals of the earth are continually taking from the atmosphere on the one hand, and are as continually casting into it on the other, so admirably arranged is it, and so perfect its system of circulation, now across the seas, now through forests, and again over deserts, burning sands, and frozen heights, that its proportions are never destroyed.

In this system of purification and preservation, we know that vegetation in active growth has much to do.

Now, then, if we consider that the N. E. trade-winds, when they arrive at the equator, ascend, return to the north in the upper regions until they reach the parallel of 30° or 40° north, where they descend to the surface, and are known as what the Germans style the S. W. passage winds; if, I say, this be the course of atmospherical circulation, we shall see that the air in our winter time, when vegetation is asleep with us, would probably not be exposed to the process necessary for its purification; and finally, if such

were the system of circulation, the atmosphere of the northern hemisphere would, in the process of ages, probably become different from that of the southern hemisphere.*

We have no reason to believe in the existence of any such change in the components of the atmosphere; and I had almost said, *therefore*, in any such partial system of circulation.

On the other hand: If we maintain that the S. E. trade-winds flow north, after ascending into the upper regions of the atmosphere, through the equatorial calms; and that it is those winds, and not the N. E. trades, that in their circuit blow our S. W. passage winds; if, I say, we maintain this, we shall see the beautiful adaptation for exposing them to the proper and wholesome vegetable agencies. Our winter is the southern summer; then the S. E. trades blow through the southern forests, which are then in their stage of activity.

Arrived at the equator—properly prepared for the use of the inhabitants of the north temperate and frigid zones—they ascend into the clouds; and, after reaching the parallel of 30° N., they descend, and are then felt as the vigorous, wholesome, and healthful S. W. passage winds of the northern winter. Continuing on towards the north frigid zone, they perform their office for the inhabitants of those inhospitable climates, and, approaching the polar regions in spirals, they whirl continually around or about the pole in a direction contrary to that of the hands of the watch.

Returning thence in the upper regions towards the south, as unfit for further use, they are next felt on

* The extra-tropical regions of the north have much more land, and therefore it may be supposed many more organs than the south to breathe, consume, and vitiate the atmosphere; consequently, in any given time, as in a northern winter, the demands upon the atmosphere are very unequal on opposite sides of the equator. On one side, the animal kingdom is exacting from it in excess; on the other—the southern summer—the vegetable.

Speaking in general terms, it may be said that man, with his retinue of domestic animals, counts in the south but as one in a thousand to his hosts at the north. These myriads of warm-blooded animals in the northern hemisphere, with the fires kindled by man in our winter, leave us to infer that more air is required for animal consumption and combustion on one side of the equator than on the other, especially in the northern winter.

The air thus used, loses the proportions of gaseous combinations required to make it wholesome; whence, therefore, is it purified? Not by the vegetation of the extra-tropical north, certainly, for its vegetation is then asleep.

But if we make this air return to the south by the route suggested, it will pass through the N. E. trade-wind regions, and be partly replenished by the perpetually active vegetation there. Then rising in the equatorial calms, and overleaping, in the upper regions, the S. E. trades, it descends to the surface in the extra-tropical south, where it is summer, and where the forces of vegetation are in their most active operation.

Returning in the upper regions towards the north, still more refreshed from this part of its circuit, it first strikes the surface again as the S. E. trades, where vegetation is again perpetually active. Being now completely purified, it rises up again in the equatorial calms, overleaps, in the upper regions, the N. E. trades, and descends in the extra-tropical north, fresh with supplies in wholesome proportions for breathing lungs and winter fires.

And thus, though we cannot tell the reason why this earth was provided with zones of perpetual summer, alternate winter, and opposite seasons, we may nevertheless see through the atmosphere one of the purposes for which this arrangement of seasons, combination of climates, and proportion of vegetable surface, was intended to subserve.

In this view, we see room for the harmony of nature. We have not a single physical fact going to prove that such is *not* the course of the circulation of the atmosphere about the surface of the earth; but we have many facts and circumstances which, though they do not prove, yet they suggest, that such is the course.

Thus, using a figure of speech, we may liken these evergreen places through which the winds go and return, to the lungs of the earth, with their three lobes; one in each of the trade-wind regions, and one now at the north, now at the south, changing from one side to the other, as the summer comes and goes.—M. F. M.

the surface within or near the tropics, where vegetation is again in activity, to fit them for the inhabitants of that region. Reaching the equatorial calms, they ascend, and next appear on the surface in the south temperate zone as the N. W. passage winds.

Continuing on towards the south pole, and approaching it in spirals, they whirl about, but in a direction *with* the hands of a watch, and opposite to that which they took about the north pole.

Ascending into the upper regions of the atmosphere, they are next felt on the surface as S. E. trade-winds. Reaching the equator, ascending, and coming over into the northern hemisphere, they are again felt to the north of the N. E. trades as the S. W. passage winds.

Let us suppose that this part of the circuit from the antarctic regions be made in our summer, and of course in the southern winter, when the vegetation here is not so active in its demands upon this atmosphere in motion, as it was in the other part of the supposed circuit. But then this same atmosphere, that has been but partially purified for northern use in the southern forests and fields, reaches us in our summer, when vegetation is in full activity, and when, therefore, all disproportions are properly compensated.

I have faith in the "Great First Thought." I believe that the animal and vegetable kingdoms are in exact counterpoise; that throughout the dominions of nature all things are in exact and rigid proportions; that there is not a green leaf too much on one side, nor an insect too many on the other. And because of this belief, I find plausibility and satisfaction in supposing that the general system of atmospherical circulation is as I have been endeavoring to represent it.

In this belief I am strengthened by my reading of a text of Scripture (and the Bible cannot any more than Nature be wrong, for the Author of both is One), which seems to apply to such a system of circulation:—

"The wind goeth toward the south, and turneth about unto the north; it whirleth about continually, and the wind returneth again according to his circuits."

Compare this with what I have already said, which my investigations taught me was the probable course of atmospheric circulation before I remembered me of what Solomon had said, and I think you will find with me, not proof, but grounds to suppose that such may be the system of atmospheric circulation.

THE PILOT CHARTS.

Letter C of the series is a Chart of the Winds; it shows the point of the compass from which the wind blows in all parts of the ocean, and for every month in the year. The numbers of this series are called the "Pilot Charts," of which the North and South Atlantic, in two sheets each, and "Coast of Brazil within the Trade-Wind Region," in one sheet, sheets five and six North Pacific, and the sheet of the South Pacific, have been published. Several other sheets, both of the Pacific and Indian Oceans, are in press. See Plate I. as an illustration of the manner in which the figures for Plate V. are obtained.

Sheets of this series are also in hand for the entire Pacific and Indian Oceans. Two, illustrative of the Cape Horn passage, have also been published.

The officers employed upon them from time to time have been Lieutenants Herndon, Dulany, H. N. Harrison, Ball, Forrest, Guthrie, Deas, and Fitzgerald; Passed Midshipmen Davenport, Powell, De Koven, Wainwright, Balch, Roberts, De Krafft, Woolley, Jackson, Murdaugh, Semmes, Johnson and Lewis, Brooke, Wells, Terrett, and Professor Benedict.

The "Brazil Pilot" is on a scale, to the square, of 2° of latitude by 1° of longitude, and extends from the equator to 23° S.

The rest of the series, except the Cape Horn Pilots, is on a scale of 5° to a square: that is, the ocean is divided off into districts of 5° of latitude by 5° of longitude.

These Charts, perhaps more than any other of the series, deserve a minute description; because, when sailing directions fail, they will supply the navigator with special information as it regards the direction of the winds for any month, and in any part of the ocean. He should consult them daily, and diligently; and, that he may do so with facility, this explanation of them is offered.

In getting out from the log-books materials for these Charts, which show in every district of the ocean, and for every month, how navigators have found the winds to blow, it has been assumed that, in whatever part of one of these districts a navigator may be when he records the direction of the wind in his log, from that direction the wind was blowing at that time all over that district; and this is the only assumption that is permitted in the whole course of investigation.

Now, if the navigator will draw, or imagine to be drawn, in any such district, twelve vertical columns for the twelve months, and then sixteen horizontal lines through the same for the sixteen points of the compass, *i. e.* for N., N. N. E., N. E., E. N. E., and so on, omitting the *by*-points, he will have before him a picture of the "Investigating Chart" (Plate I.), out of which the "Pilot Charts" are constructed. In this case, the alternate points of the compass only are used; because, when sailing free, the direction of the wind is seldom given for such points as N. *by* E., W. *by* S., &c. Moreover, any attempt, for the present, at greater

nicety, would be over-refinement; for navigators do not always make allowance for the aberration of the wind; in other words, they do not allow for the apparent change in the direction of the wind caused by the rate at which the vessel may be moving through the water, and the angle which her course makes with the true direction of the wind. Bearing this explanation in mind, the intelligent navigator will have no difficulty in understanding the wind diagram (Plate II.), and in forming a correct opinion as to the degree of credit due to the fidelity with which the prevailing winds of the year are represented on Plate XVIII.

As the compiler wades through log-book after log-book, and scores down in column after column, and upon line after line, mark after mark, he at last finds that, under the month and from the course upon which he is about to make an entry, he has already made four marks or scores, thus (||||). The one that he has now to enter will make the fifth, and he "scores and tallies," and so on, until all the abstracts relating to that part of the ocean upon which he is at work have been gone over, and his materials exhausted. These "fives and tallies" are exhibited on Plate I.

Now, with this explanation, it will be seen that, in the district marked A, there have been examined the logs of vessels that, giving the direction of the wind for every eight hours, have altogether spent days enough to enable me to record the calms and the prevailing direction of the winds for eight hours, 2,144 times; of these, 285 were for the month of September; and of these 285 observations for September, the wind is reported as prevailing for as much as eight hours at a time: from N., 3 times; from N. N. E., 1; N. E., 2; E. N. E., 1; E, 0; E. S. E., 1; S. E., 4; S. S. E., 2; S., 24; S. S. W., 45; S. W., 93; W. S. W., 24; W., 47; W. N. W., 17; N. W., 15; N. N. W., 1; Calms (the little 0's), 5. Total, 285 for this month in this district.

The number expressed in figures denotes the whole number of observations of calms and winds together that are recorded for each month and district.

In C, the wind in May prevails one-third of the time from west. But in A, which is between the same parallels, the favorite quarter for the same month is from S. to S. W., the wind blowing one-third of the time from that quarter, and only 10 out of 221 times from the west; or, on the average, it blows from the west only $1\frac{1}{3}$ day during the month of May.

In B, notice the great "Sun Swing" of the winds in September, indicating that the change from summer to winter, in that region, is sudden and violent; from winter to summer, gentle and gradual.

In some districts of the ocean, more than a thousand observations have been discussed for a single month, whereas, with regard to others, not a single record is to be found in any of the numerous log-books at the N. Observatory.

After all the materials on hand have been exhausted for the investigating sheet, its "scores and tallies" are summed up for each of the 16 points, and separately also for each month, and recorded in Arabic numerals. They are now ready to be transferred to the wind-roses of the Pilot Chart, which, it may be seen by reference to Plate V., consist of a number of engraved squares, without regard to the figure of the earth, and with four inscribed concentric circles in each; and in these circles are radii, drawn so as to

represent every alternate point of the compass-card, thus: N., N. N. E., N. E., E. N. E., E.; and so on around the compass. See Plate V.

After all the log-books within reach have been examined, and the observations collated for this letter of the series, as in Plate I., the results are collected for each district, arranged according to months, and entered, each set in its *wind-rose*, Plate V., as the circumscribed square, with its concentric circles and points of the compass, is called. These entries are made in such a manner as to show at a glance the prevailing winds for any month in any part of the ocean. Not only so, the navigator sees at a glance how many days of observation have been discussed for each month in any district; and of these he sees the number of times calms have been found, and the number of times the winds have been reported as coming from each of the sixteen points of the compass.

Thus, in the wind-rose for the district between 5° and 10° N., 15° and 20° West, and marked A, Plate V., he would observe that, in August, 705 observations as to the course of the wind had been made here, and 13 as to the calms; *i. e.* out of $\frac{718}{3}$ days, or parts of days, passed by ships in this district during the month of August of various years, the prevailing condition of the weather for consecutive periods of eight hours' duration each, was found to be calm thirteen times; and the winds were observed to blow from E. 4 times;* E. S. E., 17; S. E., 5; S. S. E., 165; S., 280; S. S. W., 171; S. W., 23; W. S. W., 26; W., 8; W. N. W., 2; N. W., 1; N. N. W., 2; N. N. E., 1; and the other points 0.

The object has been to get for these Charts at least one hundred observations for each month in every square of the ocean; this would require for the three great oceans 1,669,200 observations upon the direction of the winds alone.

In some of the wind-roses, or districts of 5° square, we have obtained more than a thousand observations for a single month; whereas, in neighboring districts and for other months, we are left without a single observation—so limited and marked are the commercial paths over the ocean, according to the seasons.

In the South Atlantic, between the route to and fro around Cape Horn, and the route to and fro around the Cape of Good Hope, there is a part of the ocean of immense extent, that is seldom traversed by any vessel. The Pilot Charts, therefore, are silent with regard to the winds there.

As the wind is found to blow in any part of any given district or division of 5° square, so it is assumed to blow at that time in all other parts of that district.

The Pilot Charts, therefore, give us the number of times that the wind, in any part of the ocean, is found in a given number of times to come from each point of the compass; and consequently, by studying the Pilot Chart, we see the ratio between the number of winds from any one point, and the number of winds from all the other points of the compass.

With such data it is practicable to calculate, according to the doctrine of chances, the track which will give the shortest average passage under canvass from port for any month.

* Taking "time" to mean a period of eight hours, or three "times" to make a day.

This I have done for the routes generally, between Europe and America; and from the ports of the United States, as far south as the parallel of Rio de Janeiro.

In order to select the best average track, from one place to another, as from the ports of the United States to Rio, or to those of Europe, the Pilot Charts have been discussed in the following manner:—

Blank charts on a scale of 5° to an inch at the equator, Mercator's projection, are constructed and lithographed for the whole ocean, twelve times over, so as to have one complete set for each month.

In every space, of 5° square, a sort of compass-card is drawn, as in Plate VI.

In the centre of this card are written two numbers—the upper number shows the times—counting 8 hours as "a time"—the winds have been observed in that square, for the given month, which in this case is July (see A—Plate VI.), and the lower number shows the per cent. of "the times" in which calms, according to the number of observations made, and the principles of averages, ought to prevail for as much as 8 hours at a time. Thus, in said square A, there have been discussed for the Pilot Charts, in the month of July, 433 observations, and of these, 8 in all, or 2 per cent. of the whole, represent calms as the prevailing condition of the atmosphere for that month and part of the ocean.

These two quantities are thus stated in order to enable me, as well as those who take the Charts for their guide, to form some estimate as to the degree of confidence due, or as to the weight to be attached to, the courses recommended and the routes proposed for vessels.

Thus, more weight is attached to a course that should be recommended through square A, than to one through square B; because, in A, average results are derived from 433 observations; whereas in B, they depend upon only 21, and calms, it appears, prevail there 11.1 per cent. of the time, which is probably out of proportion.

The object, however, is to show the proportion according to the ratio of percentage, of the winds from each point of the compass, and the percentage by which, according to that showing, a vessel in attempting to sail 100 miles, or any other distance through that square on any given course, would, on the average, have to increase that distance on account of the average prevalence of adverse winds.

Thus, suppose a vessel should wish to sail west through square B in July; an inspection of the Plate will show, supposing the 21 observations give a fair average as to the winds in that square for that month, that 16.5 per cent. of the winds there, are from the west; that 11 per cent. are from W. S. W.; 3.5 from W. N. W.; 16.5 from S. W.; and 5.5 from N. W.; all these winds are adverse for a west course, and consequently they would compel her to turn off from a west course so as to increase the distance required 37.4 per cent.

In truth, it appears from those 21 observations, that 49.5 per cent. of all the winds that blow here in July, are between W. and S. S. W., inclusive; that it is calm 11.1 per cent. of the time; and that, consequently, it is an unfavorable part of the ocean for a vessel to pass through, that wants to get from Europe to the United States, *i. e.* that wants to get to the southward and westward; it moreover appears that a vessel would have no difficulty except on account of the calms, in getting to the eastward through this same region.

Again, the square C, which is between two lower parallels, and in which we have the experience of 41 vessels to guide us; a vessel, to make a W. S. W. course through this square in July, would have to contend against 53.7 per cent. of winds directly ahead, with the chances of having to increase her distance 93.7 per cent. Here we again see the prevalence of head winds for vessels bound to the United States, and perceive that it is a bad part of the ocean for a vessel so bound to be in, though there are no calms.

It is thus that the Chart for July, for the whole ocean, is filled up from the Pilot Chart, with the per cent. of calms and head winds for each month. This is an operation which involves an immense amount of labor.

This being done, the next step in the process is, to find out the best course for a vessel bound in any other direction, to proceed in any given month.

To do this, it is necessary to find out that track, which, with the average per centum of increased distance on account of head winds, and the increase on account of detour, shall give the shortest distance from port to port—for, when that is found, it is called the shortest average route. This route, when thus found, is the route which vessels are recommended, in the Sailing Directions, to take for the several months, to and from Europe to the equator, &c.

This is a tedious operation; for a satisfactory solution of this problem is not to be attained without many trials. For instance, after crossing the meridian of 25° W., bound from Liverpool to New York, it is comparatively easy, in July, as a mere inspection of Plate VI. shows, to make westing between the parallels of 40° and 45°. But the head winds, and the detour they cause a vessel to make, when she comes to try it, may involve such an increase of distance as to make it better to take the chances by some other route; so that it is not the difficulty of getting through one square alone that has to be considered at a time, but the difficulties of getting through all united.

It may turn out, after this tentative process has been repeated again and again, that, when we come to examine and compare such results, we may find two routes widely differing, yet each requiring nearly the same distance to be accomplished. In that case, each track is traced from port to port; the percentage of head winds and detour is got at carefully for each square through which it passes, and then, in the Sailing Directions, the preference is given to that track which is least liable to calms, to adverse currents, and to other collateral drawbacks, perplexities, and delays; and which track also has in its favor the shortest distance, and the greatest number of chances for fair winds.

The centre figures in each square, Plate VI., stand as before remarked, for the whole number of observations and the per centum of calms. The next figures which are arranged along the inner circle, are the per centum of head winds for the courses on which they stand, and the outer circle of figures express the number of miles that adverse winds will compel a vessel to turn out of the way, if she attempt to sail 100 miles direct on the course on which these figures stand.

Thus, it will be perceived, that no navigator can reasonably expect that the new routes which I recommend, are to give the short passages *always*, and in every individual case. They give the shortest passages on the average, and thus offer the best chances for a short passage at all times—that's all. Those

chances, as the Charts show, may, and sometimes will, turn up adversely. Thus, a vessel trading to Europe, may be told in the Sailing Directions, that her best route in July passes through square D, and that her course through it is east. Once in a hundred times, however—and just once in a hundred on the average—the Pilot Chart to which she is referred for a guide, tells her the wind in that square comes from the east; and she may find it when she gets there directly in her teeth; she may be the unfortunate hundredth vessel; we cannot tell. All that I pretend to tell the navigator in such cases, is where he will find the greatest number of chances in his favor, and what is the best route for him to pursue. In like manner, he may be recommended not to attempt to stand W. S. W. through C., for then the chances are fifty-four in a hundred that he will have the wind directly in his teeth; still, a vessel may pass through this square seven times, and each time find—as the Chart shows it is possible, though hardly probable, she may find—the wind exactly in the opposite direction.

With this full explanation as to the process by which the new routes here recommended are discussed and discovered, the intelligent navigator who adopts them will perceive that these discoveries and these routes are no matter of opinion with me, but that they are the results of the experience of all the navigators combined, whose observations have been used in the construction of the Charts.

In the European voyages, I have found not much room for improvements as to routes, except to those shipmasters who are just entering that trade; to them, these Charts give all the information as to winds, currents, and routes, that is possessed by the oldest and most experienced "Packet Captain."

When navigators generally shall agree to follow these new routes, the average sailing passage between Europe and America will, it is believed, from what has already been done, be considerably shortened.

But the new routes which these Charts have suggested to the equator, and which lead through parts of the ocean in which the winds and currents were not so well understood as they are along the tracks to Europe, have been attended with more decided advantage, and the most signal success. Practically, they have brought the markets of India and the southern hemisphere many days nearer to our doors.

The route of all vessels bound into the southern hemisphere, whether their destination be the markets of South America, of the Pacific or Indian Ocean, is the same as far as the equator; and these Charts have actually shortened the average passage hence to the equator, from two days to two weeks, or more, according to the season of the year; this is shown by the results of actual trial. More than a hundred passages have been made by these Charts, and according to the routes prescribed. The average length of passage by the old route from the ports of the United States to the line is forty-one days. The average passage by the new routes has been so far, for January, 31 days; for February, 25; for March, 27½; April, 28½; May, 34; June, 33; July, 40 (by the old route in this month the passage is 48 days); for August, 41; for September, 39; for October, 37; November, 32, and December, 34, against 38½ by the old route for December.

The U. S. ship Saratoga (Captain Walker), and the merchant barque Dragon (Captain Andrew), sailed at the same time, both in the month of September last (1850); the Saratoga took the old route, went as far

as 19° of west longitude, and crossed the equator the forty-second day out. The Dragon took the new route; crossed the equator the thirty-fourth day, and had passed the parallel of Rio de Janeiro in 23° S. before the Saratoga had reached the line; thus making a gain of 1,500 miles upon her competitor, with a saving, that far, of ten days or two weeks on the passage.

Thus, the importance of the undertaking to collect and embody the experience of every navigator as to the winds and currents of the sea, and so to present the results of all this information that each may have the benefit of the experience of all, is brought home to our merchants; they reap benefits from it daily. Encouragement is therefore given for the vigorous prosecution of the work.

Upwards of 100,000 sheets of these Charts have been distributed, and the demands for them are daily increasing.

The information afforded by the Pilot Charts has been presented in yet another form, as Plate XVIII. The object of this plate, as already explained, is to give a sort of general idea as to the prevailing direction of the winds in different parts of the ocean without regard to exceptions, and to show at a glance the routes between the most frequented ports. It is instructive at least.

THE THERMAL CHARTS.

Letter D of the series designates the Thermal Charts; they show the temperature of the surface water of the ocean, wherever and whenever it has been observed. These temperatures are characterized by colors and symbols, in such a manner that, by a mere inspection of the Charts, the temperatures for any one month may be recognized and distinguished from the rest. The scale is Fahrenheit; and the temperatures are put down just as they are given in each log-book, without any attempt to correct for error of thermometer. The Thermal Chart of the North Atlantic, compiled by Lieutenant Gantt, in eight large sheets, has been published; also that of the South Atlantic, constructed by Lieutenant Gardner, upon the same scale.

The isothermal lines for 80°, 70°, and so on, for every 10° of ocean temperature, have been drawn for each month upon these Charts by Professor Flye.

They afford to the navigator and the philosopher much valuable and interesting information touching the circulation of the oceanic waters, including the phenomena of the cold and warm currents; they also cast light upon the subject of the hyetographic and climatic peculiarities of various regions of the earth; they show that the profile of the coast-line of inter-tropical America assists to give expression to the mild climate of Southern Europe; they increase to a marked extent our stock of knowledge concerning the Gulf Stream—that great phenomenon of the ocean—for they show that the warm waters of this Stream, as it pursues its course to Europe, have a vibratory motion, so to speak, across its course, like a pendulum slowly propelled by heat on one side, and repelled by cold on the other. It vibrates to and fro with the season, preserving in the mean time a peculiar system of convolutions that calls to mind the graceful wavings of a pennon as it floats gently to the breeze. Indeed, if we imagine the head of the Gulf Stream to be hemmed in by the land in the Straits of Bemini, and to be stationary there, and then liken the tail of the Stream itself to an immense pennon floating gently in a current; such a motion as such a streamer may be imagined to have, very much such a motion do these Charts show the tail of the Gulf Stream to have.

These Charts were prepared for the press in four sets—each set showing the temperatures for one season—but they are published with the temperatures of all four seasons on the same sheet. A close study of them will reward any student of nature for his labor.

In 1844, I read before the National Institute a paper "On the Gulf Stream and Currents of the Sea." Up to that time but little was known of this "river in the ocean," except that it exists, and conveys an immense body of warm water from the Gulf of Mexico through the Straits of Florida into the Atlantic Ocean, thence along the coast of the United States towards the shores of Europe by the way of the Grand

Banks. Beyond this* little or nothing was known with regard to it. But since the appearance of that paper, attention has been very much directed to the Gulf Stream.† The Coast Survey has been at work upon it, and the information collected by that establishment and the officers of the navy, with regard to it, added to that afforded by these Charts, may be said to exceed in philosophical extent and value all that was previously known about it.

These investigations confirm, to a remarkable extent, the speculations put forth in that paper; they have converted many of the suggestions of theory into philosophical facts, and given increased importance to the views which I had the honor to present in 1844.

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* "Upon a correct knowledge of the force and set of currents in the ocean often depends, not only the safety of vessel and cargo, but also the lives of all on board; and, owing to the want of this knowledge, hundreds of vessels, thousands of persons, and millions of property are annually cast away or lost at sea.

"I do not intend to occupy the time of members with a recapitulation here of what we do know with regard to ocean currents; that indeed might soon be told; for we know little or nothing of them, except that they are to be met with here and there at sea, many of them sometimes going one way and sometimes another; and that the waters of some of them are colder and of others warmer than the seas in which they are found. That we should have a better knowledge of them, and of the laws which govern them, is not only an important matter to those who follow the sea, or make ventures abroad, but it is also a matter of exceeding interest to all those whose enlarged philanthropy or ennobling sentiments prompt in them a desire to diffuse knowledge among their fellows, or in any manner to benefit the human race. The mere fact that this meeting is held at all, is evidence ample and complete that it is composed altogether of such. I, therefore, submit it as a question for the consideration of the meeting, whether it be not competent for the National Institute to devise and set on foot a plan for multiplying observations and extending our information upon these interesting phenomena. A subject of vast importance in the business of commerce and navigation, the currents of the ocean seem to me to be altogether worthy the attention of this Society—a series of well-conducted observations upon them would be in perfect unison with the great objects of usefulness for which it was created and now exists, and for which its distinguished members and guests have been invited, and are here assembled from all parts of the country.

"Before such an assemblage of mind and intelligence, it is necessary only to mention the meagre state of our information, even with regard to that great anomaly of the ocean, the Gulf Stream; and there will be—there can be, but one mind, as to the importance of making further observations, and of multiplying facts with regard to it. In simply reminding the Society that all we know of this wonderful phenomenon is contained chiefly in what Doctor Franklin said of it more than fifty years ago, that his facts were collected by chance, as it were, and his observations made with but few of the facilities which navigators now have, I feel that enough, and all has been done that is necessary to be done in order to impress the Institute with the importance of further observations upon it." * * —*Paper on the Gulf Stream and Currents of the Sea. Read before the National Institute, April* 2, 1844, *by M. F. Maury, Lieut. U. S. N.*

† "Linked thus with other geological agents, the currents of the sea cannot fail to present themselves to the mind of the geologist as important and interesting subjects for investigation. How much more so are they in the eyes of the navigator; with him, the source of this coast current is a matter of conjecture, and its cause a mystery. And as to its strength, its fluctuations, and the laws which govern them, his nautical books are all but silent. Nor has the history of navigation recorded the first series of systematic observations upon it.

"Proceeding farther into the Atlantic, we find a vast stream of warm water running counter to this. It is the Gulf Stream bound from the Straits of Florida to the Banks of Newfoundland, and thence to the shores of Europe. What its breadth or depth may be, we know not. We are told, indeed, that, even at the same place, it runs sometimes at the rate of two knots the hour, sometimes at five, and we know that it may always be found within certain broad limits, varying in this too at the same place, from 140 to 340 miles. With this, our knowledge of it ends; though more accurate information as to it and its offsets would many a time have saved the mariner from disaster and shipwreck, and even now, would add not a little to the speedy and safe navigation of the Atlantic.

"Though navigators had been in the habit of crossing and recrossing the stream, almost daily, for the space of nearly 300 years, its existence even was not generally known among them, until after Dr. Franklin discovered the warmth of its waters, about 70 years ago. And to this day, the information which he gave us, constitutes the basis, I had almost said the sum and substance, of all we know about it."—*Ibid.*

In the paper which, as already mentioned, was read before the National Institute eight years ago, and repeated, by request, before the Association of American Geologists and Naturalists the same year, it was remarked with regard to the Gulf Stream and its counter-current, the ice-bearing current from the north:—

"The Gulf Stream, as it issues from the Straits of Florida, is of a dark-indigo blue; the line of junction between it and the *roily* green waters of the Atlantic, is plainly seen for hundreds of miles. Though this line is finally lost to the eye as the Stream goes north, it is preserved to the thermometer for several thousand miles; yet to this day the limits of the Gulf Stream, even in the most frequented parts of the ocean, though so plainly marked, are but vaguely described on our charts. Thousands of vessels cross it every year; many of them make their observations upon it; and many more, if invited, would do the same. But no one has invited co-operation;* consequently, there is no system; and each one that observes, observes only for himself; and when he quits the sea, his observations go with him, and are to the world as though they had not been. * *

"Supposing the pressure of the waters that are *forced* into the Caribbean Sea by the trade-winds to be the *sole* cause of the Gulf Stream, that sea and the Mexican Gulf should have a much higher level than the Atlantic. Accordingly, the advocates of this theory† require for its support 'a great degree of elevation.' Major Rennell likens the Stream to 'an immense river, descending from a higher level into a plain.' Now, we know very nearly the average breadth and velocity of the Gulf Stream in the Florida Pass. We also know, with a like degree of approximation, the velocity and breadth of the same waters off Cape Hatteras. Their breadth here is about 75 miles against 32 in the Narrows of the Straits, and their mean velocity is three knots off Cape Hatteras against four in the Narrows. This being the case, it is easy to show that the depth of the Gulf Stream off Hatteras is not so great as it is in the Narrows of Bemini by nearly fifty per cent., and that, consequently, instead of *descending*, its bed represents the surface of an inclined plane from the north, *up* which the lower depths of the Stream *must* ascend. If we assume its depths off Bemini to be two hundred fathoms, which are thought to be within limits, the above rates of breadth and velocity will give one hundred and fourteen fathoms for its depth off Hatteras. The waters, therefore, which in the straits are below the level of the Hatteras depth, so far from descending, are actually *forced up* an inclined plane, whose submarine ascent is not less than ten inches to the mile!

"The Niagara is an 'immense river, descending into a plain.' But instead of preserving its character in Lake Ontario, as a distinct and well-defined stream for several hundred miles, it spreads itself out, and its waters are immediately lost in those of the lake. Why should not the Gulf Stream do the same? It gradually enlarges itself, it is true; but instead of mingling with the ocean by broad-spreading, as the 'immense rivers' descending into the northern lakes do, its waters, like a stream of oil in the ocean, preserve their distinctive character for more than 3,000 miles.

"Moreover, while the Gulf Stream is running to the north from its supposed elevated level at the

* The Wind and Current Charts have called forth the co-operation here proposed.

† That the Gulf Stream is caused by the trade-winds.

south, there is a cold current coming down from the north; meeting the warm waters of the Gulf midway the ocean, it divides itself and runs *by the side of them* right back into those very reservoirs at the south, to which theory gives an elevation sufficient to send out entirely across the Atlantic a jet of warm water said to be more than three thousand times greater in volume than the Mississippi River. This current from Baffin's Bay has not only no trade-winds to give it a head; but the prevailing winds are unfavorable to it, and for a great part of the way it is below the surface, and far beyond the propelling reach of any wind. And there is every reason to believe that this polar current is quite equal in volume to the Gulf Stream. Are they not the effects of like causes? If so, what have the trade-winds to do with the one more than the other?

"Nay more. At the very season of the year when the Gulf Stream is rushing in greatest volume through the Straits of Florida and hastening to the north with the greatest rapidity, there is a cold stream from Baffin's Bay, Labrador, and the coasts of the north, running to the south with equal velocity. Where is the trade-wind that gives the high level to Baffin's Bay, or that even presses upon or assists to put this current in motion? The agency of winds in producing currents in the deep sea must be very partial.

"These two currents meet off the Grand Banks, where the latter is divided. One part of it underruns the Gulf Stream, as is shown by the icebergs which are carried in a direction tending across its course. The probability is, that this 'fork' *continues on towards the south*, and runs into the Caribbean Sea, for the temperature of the water at a little depth there has been found far below the mean temperature of the earth, and quite as cold as at a corresponding depth off the arctic shores of Spitzbergen. * * *

"More water cannot come from the equator or the pole than goes to it. If we make the trade-winds to cause the former, some other wind must produce the latter; but these cold currents, for the most part, and for great distances, are *submarine*, and therefore beyond the influence of winds. Hence, it should appear that *winds* have little to do with the general system of aqueous circulation in the ocean.

"The other 'fork' runs between us and the Gulf Stream to the south, as already described. As far as it has been traced, it warrants the belief that it too runs *up* to seek the so-called *higher* level of the Mexican Gulf. * * * * * * * * * * *

"Therefore, this immense volume of water, in passing from the Bahamas to the Grand Banks, meets with an opposing force in the shape of resistance, sufficient in the aggregate to retard it two miles and a half the minute, and this only in its eastwardly rate. There is, doubtless, another force quite as great, retarding it towards the north, for its course shows that its velocity is the resultant of two forces acting in different directions. If the former resistance be calculated according to received laws, it will be found equal to several atmospheres. And by analogy, how inadequate must the pressure of the gentle trade-winds be to such resistance, and to the effect assigned them? If, therefore, in the proposed inquiry, we search for a propelling power nowhere but in the higher level of the gulf, we must admit, in the head of water there, the existence of a force capable of putting in motion and driving over a plain, at the rate of 5 miles the hour, all the waters as fast as they can be brought down by 3,000 such streams as the Mississippi River—a power at least sufficient to overcome the resistance required to reduce, from two miles and

a half to a few feet per minute, the velocity of a stream that keeps in perpetual motion one-fourth of all the waters of the Atlantic Ocean.

"But, in addition to this, may there not be a peculiar system of laws not yet revealed, by which the motion of fluids in such large bodies is governed when moving through each other in currents of different temperature. That currents of sea water, having different temperatures, do not readily commingle, is shown by the fact already mentioned—that the line of separation between the warm waters of the gulf and the cold waters of the Atlantic is perfectly distinct to the eye for several hundred miles; and even at the distance of a thousand miles, though the two waters have been in contact and continued agitation for many days, the thermometer shows that the *cold water on either side still performs the part of river banks* in keeping the warm waters of the stream in their proper channel.

"In a winter's day off Hatteras, there is a difference between these waters of near 20°. Those of the gulf being warmer, we are taught to believe that they are lighter; they should, therefore, occupy a higher level than those through which they float. Assuming the depth here to be 114 fathoms, and allowing the usual rates of expansion, figures show that the middle of the Gulf Stream here should be nearly 2 feet higher than the contiguous waters of the Atlantic. Were this the case, the surface of the Stream would present a double inclined plane, from which the water would be running down on either side, as from the roof of a house. As this ran off at the top, the same weight of colder water would run in at the bottom; and thus, before this mighty stream had completed half its course, its depths would be brought up to the surface, and its waters would be spread out over the ocean. Why, then, does not such a body of warm water, flowing and adhering together through a cold sea, obey this law, and occupy a higher level? If it did, the upper edges of its *cold banks* would support a lateral pressure of at least 100 lbs. to the square foot; and vessels in crossing it would sail over a ridge, as it were; on the east side of which they would meet an easterly current, and on the west side a westerly current. * * * * * * *

"The maximum temperature of the Gulf Stream is 86°, or about 9° above the ocean temperature due the latitude. Increasing its latitude 10°, it loses but 2° of temperature. And, after having run 3,000 miles towards the north, it still preserves, even in winter, the heat of summer. With this temperature it crosses the 40th degree of north latitude, and there, overflowing its *liquid banks*, it spreads itself out for thousands of square leagues over the cold waters around, and covers the ocean with a mantle of warmth that serves so much to mitigate in Europe the rigors of winter. Moving now more slowly, but dispensing its genial influences more freely, it finally meets the British Islands. By these it is divided, one part going into the polar basin of Spitzbergen, the other entering the Bay of Biscay, but each with a warmth considerably above ocean temperature. Such an immense volume of heated water cannot fail to carry with it beyond the seas a mild and moist atmosphere. And this it is which so much softens climate there. * *

"May there not exist between the waters of the Stream and their *fluid banks*, always heaving and moving to the swell of the sea, a sort of *peristaltic* force, which, with other agents, assist to keep up and preserve this wonderful system of ocean circulation? * * * * * * * *

"The line of meeting between the waters of the Gulf Stream and the Atlantic, is distinct to the naked

eye for several hundred miles. This unreadiness of cold and tepid sea water to commingle has been often remarked upon, and seems to impart to one current the power of dividing and turning others aside. Thus the Gulf Stream bifurcates the Labrador current, one part of which underruns the Gulf Stream, and the other takes a southwestwardly direction along the coast. * * * * * * * *

"*It would be curious to ascertain the routes of these under currents on their way to the tropical regions*, which they are intended to cool. One has been found at the equator 200 miles broad, and 23° colder than the surface water. Unless the land or shoals intervene, it, no doubt, comes down in a spiral curve. *

"What time more fit—what occasion more suitable than the present, for maturing a plan of operations, and for setting on foot a system of observations upon the Gulf Stream, and its kindred phenomena of the sea?"*

Thus, by a process of reasoning and argument, it was shown, more than nine years ago, that the Gulf Stream, as far as the Banks of Newfoundland, flows through a *bed* of cold water, which cold water performs to the warm the office of *banks* to a river;† and which "cold banks," thus pointed out, were discovered with the deep-sea thermometer, by Lieut. George M. Bache, U. S. N., in 1846, while operating in connection with the Coast Survey. They partake so decidedly of the character of *banks of a river*, that in the annual reports of the Coast Survey for 1846, and elsewhere, these banks were likened to a "cold wall;" and by Lieut. Bache, in his report to the superintendent of the survey, to "a bank of cold water against which the Gulf Stream butts up."‡

It was also theoretically shown that the Gulf Stream actually flows up hill:§

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* From this question may be traced the origin of the undertaking which has resulted in the "Wind and Current Charts." The Association, appreciating the importance of the subject, and the suggestions connected with it, readily came forward and used their influence in behalf of the undertaking. It was remarked to them then:—

"Gentlemen here, and good men everywhere, can do much to aid in this plan, by giving it their countenance, and using their influence with masters, by inducing them to send to Washington an abstract of their logs, though it contain only the track of the vessel, with the winds and temperatures. Even this would be valuable, and anything additional would be much more so. Our whalemen do collect, and have it in their power to give much truly valuable information. That which they collect concerns the meteorologist, the naturalist, and others, not less than the navigator and geologist. Indeed, the ocean, with its almost unsealed book of mysteries, presents to the votary of science, whatever be the name of his association, a common highway, upon which each society, like every nation, may make its ventures, and return in vessels laden with treasures to enrich the mind and benefit the human race."—*Extract from a Paper on the Currents of the Sea, as connected with Geology, read before the Association of American Geologists and Naturalists, May* 14, 1844—*by M. F. Maury, Lieut. U. S. N.*

† "The cold water on either side, still at the distance of a thousand miles, performs the part of *river banks* in keeping the warm water of the (Gulf) Stream in the proper channel."—*Paper on the Gulf Stream and Currents of the Sea.*

‡ "Here, on the left, we have the main currents of the (Gulf) Stream turned to the eastward by Cape Hatteras, and *butting up against a bank of cold water*, which it overflows."—*Report of Coast Survey*, 1846, *Appendix* No. 4, page 50.

§ "It is easy to show that the depth of the Gulf Stream off Hatteras, is not so great as it is in the 'narrows,' off Bemini, by nearly 50 per cent.; and that, consequently, instead of *descending*, its bed represents the surface of an inclined plane from the north, up which the lower depths of the stream *must* ascend. If we assume its depth off Bemini to be 200 fathoms,(*a*) which are thought to be within

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(*a*) Its depth in the Florida Pass has been ascertained by the officers of the United States ship Albany, Commander Platt, acting under the instructions of Commodore Warrington, to be 500 fathoms. That is, bottom has been obtained at that depth. Whether the Gulf Stream water reaches all the way to the bottom, is another question.

That its bottom is a bed of cold water:*

That it bifurcates a cold stream from the north, near the Banks of Newfoundland, and that one fork of this stream pursues thence, on the other side of the Gulf Stream, a *southwestwardly* course as a current of cold water, for the most part submarine:†

That it is bifurcated by the British Isles:‡

And that its surface is a double inclined plane, having the ridge, or line of meeting of the two planes, near the axis of the stream—from which the surface water, like the rain from the roof of a house, runs off towards each side.§

Thus most, if not all the conditions which the study of the subject induced me, in 1844, to announce as theoretically to exist, have since, as already remarked, been converted into physical facts by the operations of the Coast Survey, or by the navigators who have been observing in connection with the Wind and Current Charts.

The observations made in 1846 by Lieut. George M. Bache, U.S.N., for the Coast Survey,‖ and continued in 1847¶ and 1848,** by Lieutenants S. P. Lee and Richard Bache, upon the deep-sea and surface temperatures in and about the Gulf Stream, and confirmed, as to the surface temperatures, by these Charts, as well as by the observations of Lieut. J. C. Walsh, U.S.N., while observing in connection with them in

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limits, the above rates of breadth and velocity will give 114 fathoms for its depth off Hatteras. The waters, therefore, which, in the Straits, are below the level of the Hatteras depth, so far from descending, are actually forced up an inclined plane, whose submarine ascent is not less than 10 inches to the mile."—*Paper on the Gulf Stream and Currents of the Sea, read before the National Institute, by M. F. Maury, Lieut. U. S. N., April* 2, 1844.

* "As this" (the warm water of the Gulf Stream made specifically lighter by its temperature) "ran off at the top, *the same weight of cold water* would run in at the *bottom*."—*Paper on the Gulf Stream and Currents of the Sea, read before the National Institute, by M. F. Maury, Lieut. U. S. N., April* 2, 1844.

"The Gulf Stream bifurcates the Labrador current; one part of which *underruns* the Gulf Stream."—*Paper on the Currents of the Sea, as connected with Geology; read before the Association of American Geologists and Naturalists, May* 14, 1844, *by M. F. Maury, Lieut. U. S. N.*

† "Apparently, in obedience to the laws here hinted at, there is a constant tendency of polar waters towards the tropics, and of tropical waters towards the pole."—*Lieut. Maury on the Gulf Stream.*

"It would be curious to ascertain the routes of these under currents on their way to the tropical regions, which they are intended to cool. One has been found at the equator, 200 miles broad, and 23° colder than the surface water. Unless the land or shoals intervene, it no doubt comes down in a spiral curve; meeting the warm waters of the Gulf midway the ocean (the cold current), divides itself and runs by the side of them right back into those very reservoirs of the south."—*Ibid.*

‡ "It finally meets the British Islands. By these it is divided—one part going into the polar basin of Spitzbergen; the other entering the Bay of Biscay."—*Ibid.*

§ "In a winter's day off Hatteras, there is a difference between these waters of near 20°. Those of the gulf being warmer, we are taught to believe that they are lighter; they should, therefore, occupy a higher level than those through which they float. Assuming the depth here to be 114 fathoms, and allowing the usual rates of expansion, figures show that the middle of the Gulf Stream here should be nearly two feet higher than the contiguous waters of the Atlantic. Were this the case, the surface of the stream would present a double inclined plane, from which the water would be running down on either side, as from the roof of a house. As this ran off at the top, the same weight of colder water would run in at the bottom; and thus, before this mighty stream had completed half its course, its depths would be brought up to the surface, and its waters would be spread out over the ocean. Why, then, does not such a body of warm water, flowing and adhering together through a cold sea, obey this law, and occupy a higher level?"

‖ *Vide* Annual Report of the Coast Survey for 1846. ¶ *Ibid.*, 1847. ** *Ibid.*, 1848.

1850—this mass of careful observations, thus collected—all goes to confirm the theoretical suggestions of 1844, with regard to the *cold banks* and currents of cold water over or through which the Gulf Stream finds its way to the northward.

The officers of the Coast Survey, already alluded to, announced the banks of the Gulf Stream off the coast of North Carolina and Virginia, to be a "wall of cold water." They also found, as had already been predicted, the water at great depths to be a very low temperature—38° Fahrenheit.

They also found on the surface of the ocean, east of the Gulf Stream, layers or streaks of warm water. It was inferred by them that this warm water comes from the Gulf Stream—that it sent off a branch in the direction of the Island of Bermuda. It was concluded, therefore, that here was a bifurcation of this stream.

In 1850, Lieut. Walsh, who was sent out in the U. S. schooner Taney, to make certain observations which Congress had authorized the Secretary of the Navy to have made, in connection with my researches concerning the winds and currents of the sea, found like layers or streaks of warm and cold water, and came to a like conclusion as to this bifurcation or "off-set" of the Gulf Stream.

In a letter giving me an account of his cruise, which was unfortunately interrupted by his vessel proving to be unseaworthy, he says: "We discovered the *hot waters of the Gulf Stream* extending as far east as 72° 10′, in a latitude so far south as 33° 30′. The column of water temperature in the abstract, from May 23 to 29, while engaged in the search for Ashton Rock, will satisfy you of this interesting and important fact; for you will notice that whenever we reached that longitude, in our various tracks between the latitudes of 33° 30′ and 34° north, we experienced a sudden change of as much as 5° and 6° in the surface temperature—70° to 76°; this must be a branch or off-set from the Gulf Stream." This "discovery" is claimed by the Coast Survey.

Now, these Charts do not show that the temperature of the ocean between these parallels beyond the usual limits of the Gulf Stream is permanently any higher than it is between the same parallels generally, until you approach the coast of Africa. The isotherms of 70° for each month, generally, after leaving the Gulf Stream, stretch off to the eastward, going up as high, in some months, as the parallel of 45°. Recrossing the parallel of 40° north, between the meridians of 15° and 20° W., they then make a sharp turn to the southward and eastward, showing all the surface water between these lines and the equator to be permanently 70° and upwards. It is not probable, therefore, that the Gulf Stream can supply such an extent of ocean with its warm waters; nor is it clear that the warm water of the cool and warm streaks, reported as above, comes from the Gulf of Mexico. The cool water is probably the intruder from below; indeed, these Charts have revealed a natural process of heating and cooling the surface of the ocean, which I am not aware has been discovered before. It is exceedingly beautiful, and goes far to explain this phenomenon of the streaks: when the rays of the sun are operating with their greatest intensity in the northern hemisphere, they then raise the temperature of the equatorial surface of the ocean to the highest pitch. Its waters thus becoming lighter, flow to the north in a gentle surface current of warm water; and this current is probably too feeble to be detected by vessels in the ordinary course of navigation.

Thus the isotherm of 80°, for example, will pass from its extreme southern to its extreme northern declination—near 2,000 miles—in about three months.

Being now left to the gradual process of cooling by evaporation, atmospherical contact, and radiation, it occupies the other eight or nine months of the year, in slowly returning south to the parallel whence it commenced to flow northward. How natural that in flowing north it should go in layers; and in cooling, that some parts should cool faster than the others; also, that the cool water from below should now and then be forced up through the mantle of warm water with which the heat has covered certain parts of the ocean. When we come down to the lower temperature—the isotherm of 60°, for example—the reverse takes place. In this case, the most rapid motion of this isotherm is due to a movement of the waters from the hyperborean regions.

Between the meridians of 25° and 30° west, the isotherm of 60° in September, ascends as high as the parallel of 56°. In October, it reaches the parallel of 50° north. In November, it is found between the parallels of 45° and 47°, and by December, it has nearly reached its extreme southern descent between these meridians, which it accomplishes in January, standing then near the parallel of 40°. It is all the rest of the year in returning northward to the parallel whence it commenced its flow to the south in September.

Now, it will be observed, that this is the season—from September to December—immediately succeeding that in which the heat of the sun has been playing with greatest activity upon the polar ice. Its melted waters, which are thus put in motion in June, July, and August, would probably occupy the fall months in reaching the parallels indicated.

These waters, though cold, and rising gradually in temperature as they flow south, are probably fresher ; and if so, probably lighter than the sea water; and therefore it may be, that both the warmer and cooler systems of these isothermal lines are made to vibrate up and down the ocean by a gentle surface current in the season of quick motion ; and in the season of the slow motion, by a gradual process of calorific absorption in the one case, and by a gradual process of cooling in the other.

We have the same phenomena exhibited by the waters of the Chesapeake Bay during the winter.

At this season of the year, the Charts show that water of very low temperature is found projecting out and overlapping the usual limits of the Gulf Stream. The outer edge of this cold water, though jagged, is circular in its shape, having its centre near the mouth of the bay. The waters of the bay, being fresher than those of the sea, may, therefore, though colder, be lighter than the warmer waters of the ocean, and thus we have repeated here, though on a smaller scale, the phenomenon as to the flow of cold waters from the north, which force the surface isotherm of 60° from latitude 56° to 40° during three or four months.

We have, in the making of ice, and in the melting of it again, examples of this irregularity of outline on a still smaller scale. In the freezing of an ordinary pond, the fascicles of ice shoot out, and represent with their spires, the jagged edges, or the cold and warm streaks alluded to. They perfectly illustrate, in freezing, the manner in which a gentle current of warm water, overflowing a surface of cold water, may

be supposed to send out its couriers or advance streams ahead; and, in melting, the reverse, or the case of the cold water intruding upon the warmer.

Changes in the color or depth of the water, and the shape of the bottom, &c., would also cause changes in the temperature of certain parts of the ocean, by increasing or diminishing the capacities of such parts to absorb or radiate heat.

From these facts, and in the view which I am induced to take of them, I am led to infer that the mean temperature of the atmosphere between the parallels of 56° and 40° north, and over that part of the ocean in which we have been considering the fluctuations of the isothermal line of 60°, is at least 60° of Fahrenheit—and upwards, from January to August, and that the heat which the waters of the ocean derive from this source, atmospherical contact and radiation, is one of the causes which move the isotherm of 60° from its January to its September parallel.

It is well to consider another of the causes which are at work upon the currents in this part of the ocean, and which tend to give the rapid southwardly motion to the isotherm of 60°.

We know the mean dew-point must always be below the mean temperature of any given place; and that, consequently, as a general rule at sea, the mean dew-point due the isotherm of 60°, is higher than the mean dew-point along the isotherm of 50°, and this again higher than that of 40°—this than 30°, and so on.

Suppose, merely for the sake of illustration, that the mean dew-point for each isotherm be 5° lower than the mean temperature; we should then have the atmosphere which crosses the isotherm of 60°, with a mean dew-point of 55°, gradually precipitating its vapors until it reaches the isotherm of 50°, with a mean dew-point of 45°. By which difference of dew-point, the total amount of precipitation over the entire zone between the isotherm of 60° and 50°, has exceeded the total amount of evaporation from the same surface.

Now, as a general rule in the Atlantic Ocean, and it may be inferred in the Pacific also, the prevailing direction of the winds, to the north of the 40th parallel of north latitude, is from the southward and westward; in other words, it is from the higher to the lower isotherms. Passing, therefore, from a higher to a lower temperature over the ocean, the total amount of vapor deposited by any given volume of atmosphere, as it is blown from the vicinity of the tropical towards that of the polar regions, is greater than that which is taken up again. How the land may modify this position, is another question. I speak of the rule at sea, not of the exceptions on the land.

Now, then, these investigations have brought out prominently before us the facts that there is, near the tropics, both of Cancer and Capricorn, a belt of calms across the great oceans: that, on the equatorial side of these belts, the winds at the surface of the sea blow permanently towards the equator—*i. e.* they come from a cooler, and go to a warmer region; thus increasing their capacity for moisture, and consequently taking up more vapor in this part of their circuit than they precipitate down upon it again: and that on the polar side of these calm belts of the tropics, the prevailing direction of the wind on the surface

of the ocean is toward the poles—*i. e.* from a warm to a colder temperature; and, therefore, in this part of their circuit, these winds must deposit more vapor than they can take up again.

These facts, though they be not new, yet they are pressed by the Charts so forcibly upon us, that we are led irresistibly to the theoretical conclusion, that the trade-wind regions of the ocean are the evaporating regions; and that, as a general rule, in all other regions of the world, except the deserts, and a few others, mostly on the land, the evaporation is less than the precipitation, and that the excess is returned by the rivers and the rains, in the shape of currents, from towards the poles to the evaporating regions of the torrid zone; and that the total amount of rain and river water discharged into the sea, without the limits of the evaporating region, expresses the volume by which the cold currents exceed the warm currents of the sea —designating as cold currents all those which run into the torrid zone; and all those as warm, which bring their waters from it.

These Charts indicate that, upon the ocean, the area comprehended between the isotherms of 40° and 50° Fahrenheit, is less than the area comprehended between the isotherms 50° and 60°; and this, again, less than the area between this last and 70°; for the same reason that the area between the parallels of latitude 50° and 60° is less than the area between the parallels of latitude 40° and 50°; and they indicate that, *theoretically*, more rain to the square inch ought to fall upon the ocean between the colder isotherms of 10° difference, than between the warmer isotherms of the same difference.

Thus, to make myself clear: the aqueous isotherm of 50°, in its extreme northern reach, touches the parallel of 60° N. Now, between this and the equator there are but three isotherms; 60°, 70°, and 80°, with the common difference of 10°. But, between the isotherm of 40° and the pole, there are at least five others, viz: 40°, 30°, 20°, 10°, 0°, with a common difference of 10°. Thus, to the north of the isotherm 50°, the vapor which would saturate the atmosphere from zero, and perhaps far below, to near 40°, is deposited, while to the south of 50° the vapor which would saturate it from the temperature of 50° up to that of 80°, can only be deposited. At least, such would be the case if there were no irregularities of heated plains, mountain ranges, land, &c, to disturb the laws of atmospherical circulation as they apply to the ocean.

Having therefore theoretically, at sea, more rain in high latitudes, we should have more clouds; and, therefore, it would require a longer time for the sun, with his feeble rays, to raise the temperature of the cold water, which, from September to January, has brought the isotherm of 60° from latitude 56° to 40°, than it did for these cool surface currents to float it down.

After this southward motion of the isotherm of 60° has been checked in December by the cold, and after the sources of the current which brought it down have been bound in fetters of ice, it pauses in the long nights of the northern winter, and scarcely commences its return till the sun recrosses the equator, and increases its power, as well in intensity as in duration.

Thus we have here, for the first time, beautifully developed, the effects of night and day, of clouds and sunshine, upon the currents of the sea. These effects are modified by the operations of more powerful

agents which reside upon the land; nevertheless, feeble though those of the former class may be, a close study of the Thermal Charts will indicate that they surely exist.

Now, returning towards the south: we may, on the other hand, infer that the mean atmospherical temperature for the parallels between which the isotherm of 80° fluctuates, is below 80°, at least, for the nine months of its slow motion. This vibratory motion suggests the idea that there is, probably, somewhere between the isotherm of 80° in August, and the isotherm of 60° in January, a line, or belt of invariable or nearly invariable temperature, which extends on the surface of the ocean, from one side of the Atlantic to the other. This line, or band, may have its cycles also, but they are probably of long periods.

Theoretically, such a line ought to be found for any given year; but its place for one entire year may not coincide with its place for another, though the motion of such a belt from year to year would probably be very small.

The observations upon which these Charts are founded run through a period of half a century; consequently, they show the temperature for the months only, without regard to the year; and, therefore, they do not enable us to decide satisfactorily as to the existence of such a belt of uniform, or nearly uniform, ocean temperatures for any one year.

Taking the isotherms of 50° and 60° to illustrate the manner generally, in which the waters of different temperatures run into each other, we shall find that their line of separation is not smooth, but jagged. The line of junction between the warm and cold waters of the sea, is not unlike the sutures of the skull bone on a grand scale. The waters of one temperature are dovetailed and fitted into those of another, in apparently the most irregular manner; but, nevertheless, like the sutures of the skull when they come to be examined closely, these lines of articulation clearly indicate traces of symmetry. They have their laws.

Now a vessel—when waters of marked differences of temperature meet—that sails along near their line of junction, will come across layers or streaks of water, at one time warmer, at another cooler. Where a jagged point of warmer water is found in one month to thrust itself up into a body of cooler water, perhaps the next month it will be found that this obtruding of the warm water has disappeared, and given place to the intrusion from the cooler water—of an articulating surface equally irregular in its outlines. Such layers of cooler and warmer streaks of water are generally to be found along that part of the usual sailing route between New York and the north of Europe, which runs with the Gulf Stream.

There is on this route a peninsula or island of cold water, which hangs down into the Gulf Stream like a curtain dropped from the north. Its position, as well as its dimensions, vary. It often covers several degrees in extent—and it affords instances of the greatest and most sudden changes that are known to take place in the temperature of the surface waters of the sea. It is generally found about the parallel of 45°, and the meridian of 50°. Covering frequently an area of hundreds of miles in extent, its waters differ as much as 20°, 25° 30°; and in rare cases even as much as 35° of temperature from those about it.

These waters, doubtless, come down from the cold regions of the north, and are perhaps in the strongest part of that current.

The bottom of the sea in that region—the Grand Banks—assists, no doubt, in forcing this mass of cold waters to the surface; and the fact that they penetrate far down across the usual track of the Gulf Stream, at times almost cutting it in two, as it were, seems to indicate that their momentum here is greater than the momentum of the warm waters of the Gulf Stream, which they push aside; or it may be that this part of the ocean is very shallow. It would be interesting to ascertain as to this with lead and line.*

Between this peninsula of cold water and Newfoundland, there is a layer or branch of warm waters; perhaps these are brought there by a bifurcation of the Gulf Stream. Here, we have clearly and unexpectedly unmasked the very seat of that agent which produces the Newfoundland fogs. It is spread out over an area frequently embracing several thousand square miles in extent, covered with cold water, and surrounded on three sides, at least, with an immense body of warm. May it not be that the proximity to each other of these two very unequally heated surfaces out upon the ocean would be attended by atmospherical phenomena not unlike those of the land and sea breezes? These warm currents of the sea are powerful meteorological agents. I have been enabled to trace, in thunder and lightning, the influence of the Gulf Stream in the eastern half of the Atlantic, as far north as the parallel of 55° N.; for there, in the dead of winter, a thunder-storm is not unusual.

Reviewing now what has been said concerning the layers of cold and warm water along the European route of the Gulf Stream, and returning to the cool and warm streaks mentioned by Lieut. Walsh, and claimed by the Coast Survey as the discovery of a "branch" from the Gulf Stream, it appears probable that the warm waters which that survey encountered, and reported as coming from the Gulf Stream, are the warm waters properly due the latitude, and the effect of the South America shore line as far as Cape St. Roque, in sending north its warm waters. The difference of temperature may be partly due, also, to the warm waters of the surface being separated into streaks by the cooler waters of the submarine current, which, by the agitation of the ocean, are here and there brought to the surface through the thin layer of warm surface water.

If we draw a line of a degree or two in breadth from the capes of the Chesapeake and the Delaware Bays towards Cape St. Roque in Brazil, we shall find in this direction, after crossing the Gulf Stream, a remarkable layer of cool water. This layer extends to the equator, and it is more clearly marked at some seasons of the year than at others; so much so, that I have been at a loss to account for it. Like an immense lake, it is surrounded with water of a higher temperature. It cannot, therefore, be brought there by a cold surface current. It is strictly a *layer*, in contradistinction to a current.

The only idea that has suggested itself in explanation of this phenomenon, is in the conjecture that there may be, stretching off in this direction, a submerged mountain range or ridge at the bottom of the sea, across which the cold waters of this submarine current, as it forces itself down towards the equator, are brought to the surface by the agitation of the waves.

Standing out like peaks in this range, are, the islands of Fernando de Noronha, the Penedo de San

* Berryman's experiments have proved these conjectures to be well founded.

Pedro, and the Bermudas. The islands and mountains of Cuba occupy a position which a mountain spur from this sunken range might be supposed to occupy.

Lieuts. Walsh, and S. P. Lee, were directed to run across this supposed submarine range of mountains a zigzag line of deep-sea soundings, from the equator to the Capes of Virginia. (P. 217 of 6th edition.) But unfortunately circumstances proved unfavorable, and they each had to abandon this interesting part of his work.

It was announced by Dr. Bache, before the American Association at Cleveland, in 1853, that Lieuts. Craven and Maffit, U. S. N., had discovered, to the east of the Gulf Stream, off the shores of the Carolinas, and S. W. of the region indicated, a remarkable elevation or ridge in the bottom of the sea, thus tending to prove the correctness of this theoretical deduction.

The following letter from Lieut. Berryman is interesting:—

"We brought across, in a zigzag course, very satisfactory and uniform soundings, until we reached the meridian of about 48° west, where the water *deepened*, and the temperature at 400 fathoms fell to 60° from 65°; this, I suppose, must be that cold stream which you mentioned (in one of your papers on the Gulf Stream), as underrunning that stream after coming from the north over the Grand Banks. This deep water, too, was south of our deepest cast on our outward-bound course, and must be the valley of your submarine mountain, the side of which we have already ascended high enough to have only 1,300 fathoms. I shall try hard to find the top. The winds and the treacherous sea are serious obstacles. We are already driven from our line two or more degrees south of False Bermuda, and hardly a hope of getting back. I was particularly anxious to give it a sounding, for I am now convinced Walsh's wire cast was similar to one I had with 6,600 fathoms, without knowing whether bottom was had or not. The experiment was made with Brooke's sounding-ball, and the line parted in hauling it in. I think the *weight of wire* would keep it running 'forever and a day,' and feel confident Mr. Walsh's would have been considerably cut short by our mode of sounding with twine.

"In the position assigned the deep cast of Captain Barron, of the John Adams, we found only 2,550 fathoms, about one mile south. We had excellent weather, and were fortunate in sounding it at a period of the day when both latitude and longitude were obtained on the spot.

"Our cast of 1,300 fathoms is only 180 miles south of Mr. Walsh's 5,700, and ascending the east side of your submarine mountain. When our boat is sounding, two or more oars are kept going, to keep the line up and down, and when bottom is found, the oars are stopped, and the boat suffered to *ride* by the twine, and then hauled up to the mark at which the line stops running. This is repeated several times, to make sure of having bottom. I have had no chance of sounding from the vessel, and, indeed, I should never do it unless without boats entirely. The soundings taken on board any of our cruising ships, where there is any drift, *I* think, cannot be depended on when the water is over 1,500 fathoms deep, and scarcely then.

"The weather is so boisterous here, and so little to be depended on, that I fear I shall be obliged to pass over much very interesting ground, for our provisions are nearly gone; indeed, some parts of our rations are already consumed, and in a few days our grog will be stopped short, from the same cause.

* * * * * * * * * * * *

"Passing over this submarine mountain of yours, suggests to my mind the possibility of its having something to do with the growth of the *fucus natans.* We pass increased quantities of it here, and in more compact masses. May not the sides of your mountain be covered with it? Yesterday, I gave Brooke's lead or 'sounding-ball' another trial; and I am sure it reached bottom, and that the shot became detached. We hauled in several hundred fathoms, when the line parted. I am not established in the belief of recovering the line at all, for it evidently twists off, no matter how slow we haul it in. Yesterday, it was hauled in by hand very slow, giving every relief possible, when the brig rolled; but it parted under water. The water has deepened from 1,300 to 3,000 fathoms; so I apprehend we have passed the great mountain ridge. I see upon the English Chart, we are passing several casts by a vessel called Harvest, from 366 fathoms to 744. To-day we are within 70 miles, and yesterday only 40 miles of the 366 cast, and find 3,000 fathoms. Those casts were taken in 1850, by what means I do not know.* Only one opportunity has offered for ascertaining current by experiment. By our observations, they are, in this region, very uncertain. At this season of the year, I have no doubt that but few opportunities offer for any satisfactory experiments."

The isotherms of 60°, 50°, and 40°, take a northeastwardly direction across the Atlantic, and show the waters of the ocean to be as warm, indeed warmer, between latitude 60° and 65°, off the shores of Europe, than they are on this side, near the parallels of 40° and 45°.

The Gulf Stream *is* roof-shaped; that is, it is higher in the middle and lower at the edges—and has a roof-current running from the middle or axial line to either edge, as suggested in 1844. That it is so, has been proved by experiments since made with regard to it, by officers of the navy.

Thus, in lowering a boat to try a current, they found that the boat would invariably be drifted towards one side or other of the stream, while the vessel herself was drifted along in the direction of it. Now, were it possible to make a vertical section across the Gulf Stream, the top of it would appear convex, and the bottom concave, unless where the bottom of it reaches the bottom of the sea.

This feature of the Gulf Stream, throws a gleam of light upon the *locus* of the gulf-weed, by proving that its place of growth cannot be on this side (west) of the middle of that stream. No gulf-weed is ever found west of the axis of the Gulf Stream; and, if we admit the top of the stream to be higher in the middle than at the edges, in consequence of the expansion due the difference of temperature of the water in the middle and at the edges, it would be difficult to imagine how the gulf-weed should cross it, or get from one side of it to the other.

The inference, therefore, would be, that as all the gulf-weed which is seen about this stream is on its eastern declivity, the *locus* of the weed must be somewhere within or near the borders of the stream, and to the east of the middle. And this idea is strengthened by the report of Captain Scott, a most intelligent shipmaster, who informs me that he has seen the gulf-weed growing on the Bahama Banks. I have specimens of it which he had the kindness to send me, with seed-vessels, plucked up from the bottom while at anchor on the edge of the Gulf Stream. Hence we account for the fact that the gulf-weed should be seen on the eastern and not on the western borders of the Gulf Stream.

* With shoe-thread, tied to scraps of old iron.—M. F. M.

A study of the Thermal Charts will reward the student with new and better ideas as to the system of oceanic circulation. Plate XX. exhibits the mean geographical position of the March and September isotherms for every ten degrees of Fahrenheit from 80° down to 50°. These lines are taken from the Thermal Charts, series D.

Let us take the isotherm of 80° for September as an illustration; the greatest effect of the solar heat is produced upon the land during the month of August; but this Chart shows that it is September before the North Atlantic Ocean is fully supplied with its annual store of heat for the winter.

We see clearly enough, by the monthly isotherm for 80°, that the western half of the Atlantic Ocean is heated up, not by the Gulf Stream alone, as is generally supposed, but by the great equatorial caldron to the west of longitude 35°, and to the north of Cape St. Roque, in Brazil. The lowest reach of the 80° isotherm for September—if we except the remarkable equatorial flexure, which actually extends from 40° to 2° N., and rises up again to 35° N.—to the west of the meridian of Cape St. Roque, is above its highest reach to the east of that meridian. And now that we have the fact, how obvious, beautiful, and striking is the cause?

Cape St. Roque is in 5° S. Now study the configuration of the Southern American Continent from this cape to the Windward Islands of the West Indies, and take into account, also, certain physical conditions of these regions: The Amazon, always at a high temperature, because it runs from west to east, is pouring an immense column of warm water into this part of the ocean. As this water and the heat of the sun raise the temperature of the ocean along the equatorial sea front of this coast, there is no escape for the liquid element, as it grows warmer and lighter, except to the north. The land on the south prevents the tepid waters from spreading out in that direction as they may do to the east of 35° W., for here there is a space, about 18° of longitude broad, in which the sea is clear both to the north and south.

They must, consequently, flow north. A mere inspection of the Thermal Chart is sufficient to make obvious the fact, that the warm waters which are found east of the usual limits assigned the Gulf Stream, and between the parallels of 30° and 40° N. do not come from the Gulf Stream, but from this great equatorial caldron, which Cape St. Roque blocks up on the south, and which forces its overheated waters up to the 40th degree of north latitude, not through the Caribbean Sea and Gulf Stream, but over the broad surface of the left bosom of the Atlantic Ocean.

In contemplating the isotherm of 80°, for each month, we are struck with the remarkable bending towards the equator, on the eastern side of the Atlantic. This feature indicates, more surely than any direct observations upon the currents can do, the presence, along the African shores, of a large volume of cooler and running waters.

These are the waters which, heated up in the caldron of St. Roque, in the Caribbean Sea, and Gulf of Mexico, have been made to run to the north, loaded with heat, to temper climates there. Having performed this office, they are obedient still to the "Mighty Voice" which the winds and the waves obey. They are returning by this channel along the African shore to be again replenished with warmth, and to keep up the system of beneficent and wholesome circulation designed for the ocean.

The Thermal Charts abound with beautiful results and instructive facts, all of which are expressed, by the Charts themselves, much more clearly and forcibly than my pen can utter them.

It is proposed to construct from the same journals which have afforded the materials for these Thermal Charts of the Atlantic, which journals give the temperature of the air, also another set of Thermal Charts, which shall relate to the temperature of the atmosphere over the ocean; though Professor Dové, by means of his valuable Thermal Charts of the atmosphere, has rendered this labor much less interesting than in the absence of his exquisite work it would have been; for it has already been shown by this series of Charts, in connection with his, that the remarkable bending of his isotherms, as they enter the land along the western shores of Northern Europe and America, is owing, in a great degree, to the manner in which the aqueous curves of equal temperature approach those shores.

These Charts will show very conclusively, and in a manner the most striking, that the mean temperature of the ocean at the surface is higher than that of the atmosphere.

THE STORM AND RAIN CHARTS.

Letter E of the series—Storm and Rain Charts—was commenced for the North Atlantic by Lieutenant Wm. Rogers Taylor, U. S. N.; and in his absence at sea in the Albany, it has been continued by Lieutenant Wm. H. Ball, and in his absence in the U. S. ship Portsmouth, by Lieutenant George Minor.

The object of these Charts is to show the total number of observations that have been discussed for each month in every space of 5° square in the ocean; and then to show for every square and month, the number of days each in which there was rain, a calm, a fog, thunder and lightning, or a storm, and the quarter from whence it blew.

The manner in which these observations are collected from the quarry of log-books, brought together and discussed, and the officers at work upon them, remind one of the sculptor; any single stroke of the chisel, however well directed, does but little towards developing the figure, which in due time is to stand out from the rude mass upon which he is engaged. So with these observations; any single one, however accurate, is in itself worth but little. It is only by oft-repeated observations, multiplied and brought together in sufficient numbers to express their own meaning, that satisfactory and significant results can be obtained. Then, like the piece of statuary answering to the repeated touch of the chisel, the Charts speak for themselves, and all at once stand out before the compiler, eloquent with facts which the philosopher never dreamed were lurking so near.

Among the various phenomena presented in the course of these investigations, some have pointed to the moon, and suggested the inquiry: Has the declination of the moon any influence upon the bands of trade-wind and calms, by moving the edges of their zones up and down the ocean, or by accumulating an excess of atmosphere, first in one hemisphere, then in the other, according as the declination be north or south?

The abstract logs will, in the course of time, afford observations enough probably to enable me to answer this question; for it is one of those questions to which a satisfactory reply, either in the affirmative or negative, is equally desirable.

A preliminary investigation of this problem was assigned to Passed Midshipman Matthews, since lost, with all hands, in a boat at sea. His researches related entirely to the Atlantic. Before he had completed it, he was ordered away to sea; and I have not had force since to continue them. But I am apprehensive that the true answer to the question will be so masked by the effects of other causes in moving these trade-wind bands up and down the ocean, that its purport will not be perceived.

Perhaps the Pacific Ocean, when there shall be observations enough made in it, will enable me to put this question to rest.

Plate III. is a sample of the Storm and Rain Chart.

As with the Pilot Charts, so with this: the ocean is divided out into districts of 5° of latitude by 5° of longitude for these investigations, and whatever phenomenon is reported as occurring in one part of a district, is assumed to occur in all parts of that district.

Between each pair of meridians having a space of 5° between them, are 12 lines, for the twelve months, always beginning with December, the first winter month; and horizontally between each pair of parallels for each 5° there are 13 lines, eight of which are for gales from the eight semi-quadrants—one for the calms—one for rain—one for thunder and lightning—one for fogs, and the other for the number of observations called days, which have been observed for each month and district. These last are expressed in figures, and the others according to the method of "fives and tallies," already explained for other Charts.

Three observations make a day; so, in order to see how many days of observation have been discussed for any month, it is necessary to divide by three the number which stands in the column for the months, and on the line marked "days."

The object of this Chart is to show the exceptions to what may generally be considered the prevailing condition of the weather at sea, and to determine from what quarter storms are most liable to occur for each month in every district.

It may be that mariners do not *always* record in their logs rain, fog, thunder or lightning. They do always mention gales and calms, and the quadrant whence the wind blows. It may, therefore, be probable that both rains and lightning occur at sea more frequently than it would appear by the Charts they do; if so, I have no means of knowing, until I shall have received many thousands of abstract logs faithfully kept according to the form recommended by the Brussels Conference, and now universally used at sea, wherever there is a vessel commanded by a master capable of appreciating his duties, and the importance of a great work like this. But it may be presumed that mariners generally are not more apt to neglect to mention rains, thunder, and fogs in one part of the ocean than another; and that, therefore, the relative frequency with which they occur may be supposed to be fairly indicated on the chart.

But as the Chart is a fair exponent, according to the data from which it is constructed, as to the frequency of the phenomena to which it relates, we are bound to give it as much faith and credit in one respect as in another, and, therefore, to assume, until we have reason to suppose it otherwise, that the occurrence of rain, fogs, and lightning, is fairly represented in point of frequency.

The scores designate not the times that it thunders, or rains, or blows a gale, but simply the number of days on which such phenomena have been reported to occur; as an example, a gale may be accompanied with fog and rain, thunder and lightning, in which case a score would be made in the appropriate places for each.

The districts represented in Plate III. by A, B, and C, extend from 30° to 45° N., and from 55° to 60° W. Those represented by D, E, and F, extend from the equator to 15° N., between the meridians of 25° and 30° W.

This plate also affords matter that is interesting to sailor philosophers.

Examining district F, it appears that rains and calms, and N. W. gales, abound from December to May inclusive; that lightning is never seen, nor thunder heard there, from April to September inclusive; that in October there is an occasional gale from the eastward; and that from June to September may be called a rainless season, during which period there is rarely a calm, and never a gale nor a thunder-cloud to disturb the air.

This is because the equatorial calms and their train of atmospherical disturbances, have gone up, as shown per Trade-wind Charts, into district E. The rainy season in E, is the dry one of F. It may be said that E has two rainy reasons—one for about two and a half months before August, the other for three months after.

It appears from D, that the rains commence before the calms, and continue after them; that from December to March is a rainless period; and that an electric display from the clouds is a rare occurrence at any time of the year in this district.

Now going to A, the first thing that strikes us is the prevalence of fogs, the regularity of precipitation, the almost total absence of gales in June and July, the scanty rains in the former month, and the abundance of the materials from which these facts are drawn.

Contrasting this with B, we find that July and August are the months which are most exempt from storms and rain, fogs and thunder; that calms rarely occur in January, February, March, April, July, August, October, and November.

In district C, storms and rains seldom occur in April, May, June, and July. But it is needless to repeat what the Chart tells so plainly at a glance. Storm and Rain Charts for the Atlantic Ocean, North and South, have been published.

THE WHALE CHART.

In 1847, materials sufficient having been collected from the log-books of whalers for an investigation into the habits and places of resort of the whale, Lt. Wm. L. Herndon commenced the construction of this Whale Chart F for the whole ocean, excepting the North Atlantic.

The object of this Chart is to show at a glance where this fish has been most hunted; when, in what years, and in what months it has been most frequently found—whether in shoals, as stragglers, and whether sperm or right. The sheets are numbered letter F of the series.

Lieut. Herndon was interrupted in these highly interesting investigations, by orders for sea service. He had proceeded far enough, however, with the Charts, to develop some of the first fruits, which, it might be expected, are concealed in a field so abundant with treasures as this may be well supposed to be. But these orders deprived me of the assistance of a most valuable officer, and greatly delayed the work.

The plan of conducting these investigations is by spaces of 5° square, and the observations are so entered as to show at a glance the number of days for each month that vessels have spent searching for whales in each square; the number of days in which whales—and whether they are sperm or right—have been seen; also, the years in which whales of either kind were seen, and the years in which they were not seen, in any given square.

As observation after observation in such an immense field was recorded day after day, with the most untiring industry, and as the oft-repeated process finally began to express a meaning, I was surprised to

find the lines for entering the right whales were blanks, through certain districts of the ocean, from one side of the Chart to the other. Finally, it was discovered that the torrid zone is to this animal forbidden ground, and that it is physically as impossible for him to cross the equator, as it would be to cross a sea of flame. In short, these researches show that there is a belt from two to three thousand miles in breadth, and reaching from one side of the ocean to the other, in which the right whales are never found.

Hence the discovery that the fish called the right whale in the northern hemisphere is not the fish which goes by this name in the southern; that the right whale of Behring's Strait and the whales of Baffin's Bay are probably the same animals; and if so, the conclusion is almost inevitable that there is at times, at least, an open water communication through the polar regions between the Atlantic and Pacific Oceans; for this animal, not being able to endure the warm waters of the equator, could not pass from one ocean to the other unless by way of the arctic regions.

The investigations connected with these animals have also assisted to point out the great currents of warm water which keep up the ocean circulation of the Pacific—it might be said, of the globe; for, as we study their habits, these dumb creatures teach us by their instincts that there are continuous currents in the sea, between places the most remote.

After Lieutenant Herndon was called away, the investigations for these Charts were continued by Lieutenant Leigh, for a short time. His duties were soon changed, and I remained without force to resume the work, till late in 1850, when Lieutenant Fleming reported for duty. He was set to work on the Whale Charts, but before he had made any progress with them worth the name, he was detached, and ordered on other duty. Passed Midshipman Jackson then took them in hand and completed them.

They show in what part of the ocean the whales "use" in each month, and the knowledge cannot fail to prove of great importance to the whaling interests of the country—an interest which keeps in continual occupation a fleet of 600 sail, manned by 15,000 American seamen—and which fishes up annually from the depths of the ocean, property, the real value of which far exceeds that of the gold mines of California.

It is the custom among whalers to have their harpoons marked with date and the name of the ship; and Dr. Scoresby, in his work on Arctic voyages, mentions several instances of whales that have been taken near the Behring's Strait side with harpoons in them bearing the stamp of ships that were known to cruise on the Baffin's Bay side of the American continent; and as, in one or two instances, a very short time had elapsed between the date of capture in the Pacific and the date when the fish must have been struck on the Atlantic side, it was argued, therefore, that there was a northwest passage by which the whales passed from one side to the other, since the stricken animal could not have had the harpoon in him long enough to admit of a passage around either Cape Horn or the Cape of Good Hope.

The whale-fishing is, among the industrial pursuits of the sea, one of no little importance; and when the system of investigation out of which the Wind and Current Charts have grown, was commenced, the haunts of this animal did not escape attention or examination. The log-books of whalers were collected in great numbers, and patiently examined, co-ordinated, and discussed, in order to find out what parts of the ocean are frequented by this kind of whale, what parts by that, and what parts by neither. (See Plate XIX.)

Log-books containing the records by different ships for hundreds of thousands of days were examined, and the observations in them co-ordinated for this Chart. And this investigation, as Plate XIX. shows, led to the discovery that the tropical regions of the ocean are to the right whale as a sea of fire, through which he cannot pass, and into which he never enters. The fact was also brought out that the same kind of whale that is found off the shores of Greenland, in Baffin's Bay, &c., is found also in the North Pacific, and about Behring's Strait, and that the right whale of the northern hemisphere is a different animal from that of the southern.

Thus the fact was established that the harpooned whales did not pass around Cape Horn or the Cape of Good Hope, for they were of the class that could not cross the equator. In this way we were furnished with circumstantial evidence affording the most irrefragable proof that there is, at times at least, open water communication through the Arctic Sea from one side of the continent to the other, for it is known that the whales cannot travel under the ice for such a great distance as is that from one side of this continent to the other.

But this did not prove the existence of an open sea there; it only established the existence—the occasional existence, if you please—of a channel through which whales had passed. Therefore, we felt bound to introduce other evidence before we could expect the reader to admit our proof, and to believe with us in the existence of an open sea in the Arctic Ocean.

There is an under current setting from the Atlantic through Davis's Strait into the Arctic Ocean, and there is a surface current setting out. Observations have pointed out the existence of this under current there, for navigators tell of immense icebergs which they have seen drifting rapidly to the north, and against a strong surface current. These icebergs were high above the water, and their depth below was seven times greater than their height above. No doubt they were drifted by a powerful under current.

Now, this under current comes from the south, where it is warm, and the temperature of its waters is perhaps not below 32°; at any rate, they are comparatively warm. There must be a place somewhere in the Arctic seas where this under current ceases to flow north, and begins to flow south as a surface current; for the surface current, though its waters are mixed with the fresh waters of the rivers and of precipitation in the polar basin, nevertheless bears out vast quantities of salt, which is furnished neither by the rivers nor the rains.

These salts are supplied by the under current; for as much salt as one current brings in, other currents (§ 113) must take out, else the polar basin would become a basin of salt; and where the under current transfers its waters to the surface, there is, it is supposed, a basin in which the waters, as they rise to the surface, are at 30°, or whatever be the temperature of the under current, which we know must be above the freezing point, for the current is of water in a fluid, not in a solid state.

An arrangement in nature, by which a basin of considerable area in the Frozen Ocean could be supplied by water coming in at the bottom and rising up at the top, with a temperature not below 30°, or even 28°—the freezing point of sea water—would go far to mitigate the climate in the regions round about.

And that there is a warmer climate somewhere in that inhospitable sea, the observations of many of the explorers, who have visited it, indicate. Its existence may be inferred also from the well-known fact that the birds and animals are found at certain seasons migrating to the north, evidently in search of milder climates. The instincts of these dumb creatures are unerring, and we can imagine no mitigation of the climate in that direction, unless it arise from the proximity or the presence there of a large body of open water. It is another furnace (§ 147) in the beautiful economy of Nature for tempering climates there.

Relying upon a process of reasoning like this, and the deductions flowing therefrom, Lieutenant De Haven, when he went in command of the American expedition in search of Sir John Franklin and his companions, was told, in his letter of instructions, to look, when he should get well up into Wellington Channel, for an open sea to the northward and westward. He looked and saw in that direction a "water sky." Captain Penny afterwards went there, found open water, and sailed upon it.

The open sea in the Arctic Ocean is probably not always in the same place, as the Gulf Stream (§ 152) is not always in one place. It probably is always where the waters of the under current are brought to the surface; and this, we may imagine, would depend upon the freedom of ingress for the under current. Its course may, perhaps, be modified more or less by the ice on the surface; by changes, from whatever cause, in the course or velocity of the surface current, for obviously the under current could not bring more water into the Frozen Ocean than the surface current would carry out again, either as ice or water.

Every winter, an example of how very close warm water in the sea and a very severe climate on the land or the ice may be to each other, is afforded to us in the case of the Gulf Stream, and the Labrador-like climate of New England, Nova Scotia, and Newfoundland. In these countries, in winter, the thermometer frequently sinks far below zero, notwithstanding that the tepid waters of the Gulf Stream may be found, with their summer temperature, within one good day's sail of these very, very cold places.

At the moment of reading proof, I receive a copy of the New Bedford Whalemen's List, containing an account of Dr. Petermann's paper, "read some time since" before the Royal Geographical Society, going to show that the whale fishery may be conducted with advantage in the Spitzbergen Sea. My attention has been attracted to the subject for some time; and last fall a gentleman known as the most enterprising of American whalemen, made me a visit for the purpose of consulting upon that subject. There seems to be no reason why whales should not be as abundant in the Arctic Sea, north of Europe, as they are in the Arctic Sea north of Asia and America. Physically, my researches have pointed out but one condition in the Arctic Sea, north of Europe, differing from the conditions in the other parts of the Arctic basin. I mean conditions which affect the whales; and that is, the Arctic Sea north of Europe is fed directly by the Gulf Stream; and these waters, therefore, may not be as favorable to the well-being of the whales, or to the production of their food, as waters are that have been a longer time in the polar basin. I mention this as a *possible* difference, because it is the only perceptible difference, and notwithstanding that whales have been found in those seas, which indicates that there is no real difference so far as the whales are con-

cerned. Nevertheless, the whales that have been found there may have been found in waters that were running out as an eddy to the Gulf Stream.

I have the abstract log of the brig Cyclops (R. Calhoun) from Boston to Archangel and back, in the summer of 1849. That vessel was in the waters of the Gulf Stream all the way, except for two days while passing the Grand Banks; and on the Grand Banks she found the water from twelve to fifteen degrees colder than she did beyond Cape North, on the polar side of the 71° of north latitude. But I see no reason for the conclusion that Gulf Stream water is not as congenial to the right whale as any other water, when reduced to a temperature that affords the climate in which that fish most delights; and being favorably impressed with the probability of finding in those regions a valuable whaling ground, I said all that it was proper to say to encourage this adventurous seaman in his bold enterprise. The regions round about Nova Zembla were thought to be most inviting. He left me determined to make the attempt in the fishing season of 1855, and I doubt not that by the time these pages reach the public eye, he will be on the ground with his vessel, busily engaged in "cutting in and trying out."

Plate IX. exhibits an extract from the Whale Chart.

The object of these Charts is to show where the whalemen have hunted, and where they have found their game; consequently, this Chart enables us to designate those parts of the ocean where the whales "use," and those parts where they never go—and to tell where in each month this animal is most likely to be found.

The three horizontal lines, Plate IX., marked D. R. S., in the middle column, repeated from parallel to parallel, stand: D. for days, R. and S. for the number of days, each, on which whales, right or sperm, have been seen. The days of search are expressed in figures; the days on which whales are seen are expressed by the system of "fives and tallies," as already explained with regard to the winds.

It will be observed that, from 60° north to 60° south, between the meridians of 125° and 130° W., right whales, except in one instance, have never been reported by any of the vessels whose logs have been examined. That sperm whales, except a straggler or two, have never been seen between these meridians, and below 5° S.; between which parallel and the equator they are most abundant. That they are seen between 35° and 50° N.; between the equator and 10° N.; but not between 10° and 35° N.; and the inference is drawn, from the fact of their appearing so frequently between the parallels of 35° and 50° N., that warm water is found there.

The investigations for this Chart are so conducted as to show the years in which the whales have been searched for and seen in the various districts of the ocean. These results are the embodied experience of several hundred whaleman as to the best fishing-grounds.

Besides the practical advantages which it is conjectured will inure to the whaling interest from these investigations, much information of a highly interesting character will probably be elicited by them for the naturalist and the geologist.

Scenes and information, how interesting soever to the world at large they may be, yet, by often recurring, lose their novelty to classes; they become familiar, cease to strike, and are at best apt to be

thought not worth speaking or writing about. This is particularly the case with regard to the whalemen and their calling.

With the view of reminding them how little is known by the world generally, with regard to the habits of the whale, it may be remarked that the information conveyed in the communications from them, which are now published, and which information has been obtained from them by accident or chance, as it were, will be read with much interest by men of science.

The gentlemen who were kind enough to furnish this information, had, I am sure, no idea of its publication; but I hope they will excuse the liberty for the sake of the motive.

These papers will, it is hoped, be the means of calling forth much additional information of a kindred nature.

LETTERS FROM WHALEMEN.

Capt. Daniel McKenzie to Lieut. Maury—dated, New Bedford, June 8, 1849.

Herewith I forward some additional knowledge of *sperm whales;* their *history*, *habits*, *food*, *age*, &c.; also the laws that govern their migratory movements, with such other thoughts as may occur to memory as I write.

The sperm whale, though found in every sea and clime, yet its great nursery is in the great Pacific; its haunts are found there from coast to coast; its limits that of the ocean itself. The males are more frequently found in high latitudes, the other sex in milder climates; a tropical region seems to suit them best; they seek bays in islands and coral beds and reefs in vast shoals to bring forth their young. The period of gestation I do not know. Perhaps no animal found in the sea is more timid and easier frightened; they always group by themselves, and seem to shun the society of other tribes of the ocean.

Their powers of vision are exceedingly limited; they cannot see directly ahead of them; hence they often, when alarmed, run foul of each other and foul of other objects. I have seen them run against a whaleboat, and the concussion so alarmed them as to create the most convulsive frenzy; and I think they are as unconscious of the approach of the harpooner from that direction as when he follows after them. Their exquisite sense of hearing, however, is most extraordinary; not unfrequently in large shoals covering miles of space, the instant one is attacked, the whole shoal, for miles around, spring, shoot out their heads above water, and listen for a moment, and if the attack is made on a female (or cow), they will all rush with great speed to their wounded companion, as if to extend their sympathy, if nothing more, unconscious of their own danger. The bold whaler avails himself of their approach, lays off a short distance from his bleeding victim, and takes them as they come; and if he is clever at the deadly game, he will mortally wound several, ere they discover the tragic act he is playing; but if the first one attacked happens to be a male, nine times in ten the shoal will run off with such rapidity as soon to be out of sight. The cows are found in shoals from twenty-five to a hundred in number, not only at their usual haunts while feeding, but also in their migratory movements in search of food, accompanied generally by one

large bull, who seems to reign over all as king, whose head is always found covered with scars and wounds, the result, as we always thought, of battles fought with other bulls in defending his gallantry for the other sex. The principal article of food (and, indeed, the only one, as far as I know) is squid; the smaller kind they eat is found near the surface, and is from two to three feet in length; the larger kind, which probably have their haunts deep in the sea, must be of immense size—the flesh soft and of gelatinous substance. I have seen very large junks floating on the surface entirely shapeless. The cows on an average will yield fifteen barrels of oil; the males (or bulls, as whalers call them) are much larger, will yield from fifty to one hundred barrels of oil. At this stage, he is a noble animal, moving through the water so graceful and with such majesty, and with such astounding velocity; and that, too, without apparent muscular action, is sublime; and when attacked, such perfect command over his locomotion as to entirely change his position as quick as thought. I have seen them lay motionless fifty feet off, and in an instant swing their huge flukes under us, and at one blow send the boats in splinters, men and all, ten feet in the air.

Large whales are seldom seen in groups; frequently, four or five are found within as many miles of each other, but more frequently alone. In their several stages of growth, the males will be found in shoals all very nearly of a size; some shoals will yield 20, some 30, some 40, and sometimes 50 barrels, each whale. The males, when very young, frequently accompany the other sex, as boys and girls go to school together, and as they approach a more mature stage, they separate.

I have never been able to approach any satisfactory result in relation to the time a sperm whale lives; the general opinion is that they live forty or fifty years. I once extracted the barbed end or head of a harpoon from the back of a large whale, inclosed nicely in the oily blubber, and the wound entirely healed where it had been lodged fourteen years. This was satisfactorily proved after we got home, by the initials of the blacksmith who made it, on one side, and the initials of the captain on the other. I remember the whale yielded about fifty barrels of oil; there was nothing in the appearance of the whale indicating old age. I have often noticed their teeth rotten and decayed down to the jaw, and others worn down level with the gum by mastication, and covered with wrinkles and furrows, having a way-worn appearance, evident marks of slow but progressive deterioration.

The ship Balena, of this port, Capt. E. Gardner, while at anchor at Karakakua Bay, in Owyhee, took a large sperm whale off the bay, that yielded them one hundred and two barrels of oil, whose teeth were worn down level with the gum, evidently by masticating his soft food. This noble animal had no other appearances of extreme age, but seemed to have enjoyed full vigor of health and life; who, then, can tell the length of life they reach, ere it terminates by the ordinary process of nature! May it not as probably reach a hundred years, as close at forty?

I have said that the cows seek bays and still water to bring forth their young; they never visit shallow water; they go to such bays only where the water is blue and deep, and under the lee of islands and reefs—the bays at the great island of Albemarle, of the Galapagos group, is often visited by large shoals of cows for that purpose—the water in those bays is of great depth, and as blue as the Gulf Stream.

I have said that squid is the only article of their food. I am aware that others think differently; that they do eat other fish. I can only judge from what I have seen. After a sperm whale is mortally wounded, and is in his last struggle, he not unfrequently throws up the contents of his stomach; which, in the hundreds of instances I have seen, I have never discovered anything but parts of squid. In cutting them up, also, I have often opened the stomach, and never noticed anything but squid; hence, I infer that squid is their only food.

Their great object of migrating from place to place is no doubt in search of food; they are often seen in large bodies, moving quickly, all in one direction; by getting their course as they pass, and following on after them, in a few days, again meet them brought to, feeding, and laying quite still, and headed in different directions. In this case, the whaler often succeeds in getting a large share of oil before they are so harassed and cut up as to compel them to abandon the ground.

I have often thought that currents had much to do with the movements of sperm whales; and as they are most always found heading it where it is strong, I have thought it was to meet the bait brought down with the current, particularly near the equator in the Pacific, where a current is always found setting to the westward, which grows stronger as you proceed westward, and the whales generally found stemming it headed to the eastward.

I have spoken of the timidity of sperm whales. I have known, near the land, where sperm whales were lying entirely still, a seal to spring in among them, and start them to running with great violence. I have also known them started and set running by the approach of porpoises.

It is remarked by many experienced sperm whalers—though I never noticed it very particularly myself, except in large whales—that, after rising to the surface from their deep submarine explorations, they would breathe or spout as many times as they will yield barrels of oil. How this rule works with small whales, I never noticed; but I do know that those we rank as large whales, yield from fifty to one hundred barrels—do, when undisturbed, spout from fifty to one hundred times; as a general rule they spout from sixty to seventy times, and yield, when taken, from sixty to seventy barrels of oil.

Large sperm whales remain submerged in search of food, from an hour to an hour and a half, which I presume is as long as they can hold their breath, for when they rise (unless disturbed or making a passage) they lay quite still, as if breathing was the ostensible object.

That sperm whales do perambulate the whole ocean, I have no doubt. Instances are known of their being harpooned on the Japan coast, and, disengaging themselves from the boat, have afterwards been taken on the coast of Chili; this was known by the ship's mark on the harpoon. One instance is known where a sperm whale was thus struck on the coast of Peru, and subsequently taken off the coast of the United States.

I have often met sperm whales off the Cape of Good Hope, and off Cape Horn, making their passage from sea to sea.

I notice our ships have discovered a new region, new haunts for right whales. They enter the Yellow Sea early in the season; and as it advances, they proceed north, through the Straits of Corea into the Sea

of Japan; thence north up the Gulf of Tartary; thence through the Perouse Strait into the Sea of Seghalien; thence up the Ochotsk, following the whales as they proceed north.

Others have passed up the Sea of Behring or Kamtschatka, north through Behring's Straits into the Arctic Sea, where whales are found large and plenty; sea smooth, and weather in the summer months (from the extreme length of the day) favorable for whaling. Several ships have been whaling successfully in those parts. The polar whale (as it is called) yields very rich oil, and the bone is larger and longer than that of the northwest coast, and fetches a better price in the market.

A free communication by our whalers through those remote seas, will develop the phenomenon of winds and currents there; they will also, in cruising for whales, discover the hidden dangers (if any), and thus contribute to assist the hydrographer in preparing charts to guide future navigators.

Herewith I forward you a history of the sperm whale, by Capt. F. Post, of this city; also the history of Nantucket, the once great whaling nucleus of the world, from which you can find many useful statistics of early whaling.

History of the Spermaceti Whale, by Captain Francis Post.

It is a matter of much surprise, that, while the whale has been so long and so extensively an object of commercial pursuit, so little should be generally known of the animal.

There is, perhaps, scarcely a being in the animal world, at least not one whose existence has been so long known, the habits, structure, and qualities of which are less known to the naturalist than are those of the whale. It is a very prevalent opinion that whales spout water. Morse, in his *American Geography*, tells us that whales spout water to a great height, and we find many writers have been led into the same error; but it is well known among whalers that whales never spout *water*, and that their spouts, which are simply dense respirations, emitted with some force from their large nostril, never ascend above twelve feet high; and when the whale is unmolested, seldom to that height, or to one-half of it.

The spermaceti whale has but one spiralle through which it respires; this is on the left side of the upper part of the head, and within a few inches of its end; it is about fifteen inches long when closed; and, when extended, from five to six wide. The spout shoots obliquely forward and upward, expanding when it rises like a whiff of tobacco smoke, which it much resembles in form; it is visible but for a moment; is near the same density as fog, and, when blown in the face, the same degree of dampness is felt from it. When the air is clear and cool, and a moderate breeze is blowing, so that the sea is not much ruffled, the spout of a large whale may be seen from a ship's masthead the distance of nine miles—the white spout forming a fine contrast with the blue field above which it rises, and appears at intervals of almost as much exactness as can be measured by a first-rate chronometer. When whales spring out of the sea, the spray produced by their fall is so great as to be seen 15 miles—in one of these playful gambols they are frequently first discovered.

The males of this species are out of all proportion the largest, and they are generally found alone; it is then quite astonishing to see with what exactness they pursue their course. Not unfrequently they are

pursued by a ship the space of a whole day together without altering their course a single point of the compass. What can enable these inhabitants of the deep to thus pursue an undeviating course for a day, and most likely for as long a period as they choose?

So far as our knowledge extends, the inequalities of the earth's surface beneath the sea are similar to those above; and the conjecture, therefore, is a reasonable one, which supposes that the utmost cavities of the sea, do not exceed the loftiest heights above it. May not then these occupants of the watery world, like those of earth and air, be guided on their way by visible objects? For without such guidance, no animal, man not excepted, can long pursue an unvarying course. Instinct may urge the animal *when* to move, but something discernible must aid its way through the deep with such precision. Nor is it at all unreasonable to suppose that, by a wise provision of nature, their organs of vision are as well adapted for the watery element, as ours are for the aerial one.

The large whales generally spout from fifty to sixty times when at the surface, and the spouts appear at intervals of about fifteen seconds, though when the whale first appears they are rather more hurried than afterwards; this occupies nearly a quarter of an hour, after which they go down, and stop beneath the sea an hour, or an hour and a half, but never exceed this before they return to the surface again for the purpose of respiration. Thus, between one-fourth and one-fifth of their time is occupied in sustaining vitality, by breathing atmospheric air. The periods of time passing while the whale is in the depths below are often nicely measured. In one instance the writer was in pursuit of a whale which was going quite fast nearly a day, and all this time he never stopped beneath the surface more than fifty-two minutes, nor less than fifty; he spouted no more than 48 times at a rising, nor less than 46. His other movements were equally uniform.

It is observed that whales suspend their breath longer in some seas than in others, probably because they go deeper for their food. Some idea may be given of the depth to which they go, by stating that when harpooned it is sometimes necessary to connect three or more lines together to prevent them from escaping. Each of these lines is commonly 225 fathoms long, so that if a whale take from boats four of these lines, there is attached to it a continued line nearly a statute mile. It would not, however, go the whole depth; but, unless the descent was perpendicular, the whale's course would describe a sort of curve, and from the great length of line out, and pressure of the sea on it, the whale would continue to take line from the boats until it reached the surface, or nearly so. When in this condition the whale appears, it is generally found in an exhausted state, arising principally, it may be supposed, from its fright and struggles to get free, though some conceive it to be produced by the weight of the vast volume of water that must have pressed upon it while in the sea beneath. But this latter hypothesis seems rather untenable; for, though the pressure may be great, yet if small fry such as are caught from an hundred fathoms or so, can bear this pressure, then one bulky whale is not likely to get squeezed beyond endurance in the deepest cavern of the sea.

Spermaceti whales are rarely, if ever, seen on soundings, though they are often seen and taken near land; but in this case there is always a bold shore and great depth of sea.

It is difficult to assign a reason why these whales are so partial to a deep sea, when all other kinds frequent shallow bays and harbors. Cuttle or squid, supposed to be the only food which sperm whales ever eat, are often found in shoal water; there is, however, a species of this fish, the exact size of which is not known; but it is presumed to be large, as whales, in the agony of death, frequently eject from their stomach pieces as large as the bulk of a barrel, and these in large quantities; so that the assertion of the naturalists that the whale, though the largest of animals, is one of the smallest eaters, is untrue. Large pieces of squid are often seen floating on the sea, which whalers consider indicate good whale ground.

The manner in which they take their food is rather curious, and affords a singular specimen of animal ingenuity. While the whale is making little or no progress through the sea, its capacious mouth is extended, by having the lower jaw dropped down, and the inside being white, the squid darts swiftly in. Whales are often seen in this position, and it is known that squid will spring at white and shining objects in the sea, for in this way are they caught. But for this stratagem, the whale might seek other food than the squid; for they are extremely active, and if pursued, could, by frequent evolutions, easily evade the pursuit of a whale.

The general color of this species of whale is a dark-bluish gray, though some have large and irregular formed spots of white on them. The exterior surface of the animal is a thin tender substance of a glass-like slickness, which is easily broken, and forms what anatomists might call the cuticle; beneath this, and upon the blubber, is a short, soft, furry substance, that covers the whole whale. The blubber is of various thicknesses upon different parts of the body, and may average about 9 inches, though this depends wholly on the size of the whale. Some of this species have yielded 120 bbls. of oil, and as this comes only from the head and blubber, some notion may be formed of the enormous bulk of a large whale. Such a mass of animation cannot weigh less than sixty tons, and yet this animal, by all odds the largest that now exists, and unquestionably the largest that ever did exist, has, by a love of the marvellous, been greatly magnified. When we are told that whales have been found to measure 160 feet in length, we cannot say, that

"Travellers ne'er did lie."

That they are, or ever have been formed of such prodigious length, is wholly improbable; that sword-fish and thrashers attack them, is equally so. But lay hyperbole aside, and reduce the size of a whale to flat reality, and it is then certainly a monster to excite our wonder.

The following are the dimensions and admeasurement of a large sperm whale that yielded 95 bbls. of oil; and it may be asserted, without fear of contradiction, that the description of one which makes the dimensions exceed these more than a few feet, is entitled to no credence. The whole length of the whale, from the end of the head to the end of the tail, was 62 feet; circumference at the largest part of the body, 32 feet; head 20 feet long, under jaw 16 feet long, and contained two rows of teeth, 22 in each (the upper jaw has seldom any teeth, and when it does they are very small). The tail was six feet long and 16 broad. The head usually yields about one-third part of the whole quantity of oil produced. The tail of the whale, like that of all the cetaceous tribe, is horizontal to the body; and when wielded as it is by a great number

of sinews, some of which are as large as a man's wrist, forces an irresistible blow, to which a cedar whale-boat forms a puny shield. The tail is between a triangle and semilunar form, and is the principal organ for impelling the whale along. The two pectoral fins serve rather to guide than to produce its motion. From the head to the hump, the whale approaches to a circular form; from thence the body terminates in an uneven ridge above and below, and diminishes in size till, at the junction of the tail, it is not above six feet in circumference; this hinder part of the body measuring much more vertically than horizontally. The hump is a protuberance on the whale's back about two feet high, and when the whale is swimming along the surface, this is seen elevated so much above it. The whale has no external ears, but two small apertures for admission of sound; the eyes have movable lids, and are between three and four inches in diameter.

In comparison with the males, the females are diminutive, a full-grown one of the latter not exceeding in bulk one-fourth of that of the former, and seldom making more than twenty bbls. of oil, often much less. They are found in herds together with their cubs, varying in numbers from fifteen or twenty, to above a hundred; among them are some scarcely ten feet long. The writer had one of these nursling cubs hoisted on deck whole, which measured fourteen feet in length, and yielded no more than twenty gallons of oil. This afforded an excellent opportunity of examining the internal structure of the whale; and on an occasion like this, the young whaler is never backward in doing so; as, by observing the position of the seat of life, he is enabled afterward to point his lance with a more deadly aim. Though it be somewhat, perilous, an encounter with one of these immense herds is a whaler's delight, since sometimes no less than eight or ten reward the adventurer's exertions. It is a singular fact that, when one of these whales is harpooned, though the herd, or shoal, as it is commonly called, be separated some miles apart, it is instantly perceived by the whole, and they either rush with great velocity towards the wounded whale, or decamp and leave it to its fate. If the whales surround the wounded one, they of each boat may select one of them for themselves; and when they are killed, to prevent their being lost (for as they are near the specific gravity of the sea, but a small portion of their bodies remain above it), a hole is cut in each whale, and a pole some fifteen feet long, with a small flag affixed to its upper end, is placed vertically therein. This done, the boats may go in pursuit of more, as there is now no danger of their being lost, and they may be taken alongside the ship at leisure. But it often happens, when a whale is "struck" in one of these large bands, that the others all seek safety in flight, and then the whalers must content themselves with *slim fares.*

Either a whale's sense of hearing must be singularly acute, or else its vision is very powerful in a clear aqueous medium, for by one of these senses it is enabled to ascertain, a long way off, when another whale is attacked. Water, it is said, on account of its density, has the quality of propagating sound farther than the rarity of the air will admit it; though it has only been ascertained that sound can be transmitted far *over* water, not *through* it.

When unmolested, the velocity of whales is not often more than three miles per hour, though when alarmed and closely pursued, they are capable of swimming at the rate of ten miles per hour; but they

never go long at this pace before it diminishes to four or five. On receiving a wound in the vitals, they spout out amazing quantities of blood, so as to color the ocean for many yards around. Instances are common, notwithstanding their mighty strength and size, of whales expiring in a moment after receiving their death wound. Sometimes, in apparent fright, they use every effort to escape from their merciless assailants, and not unfrequently, in plunging into the depths of the sea and drawing all the lines from the boats, succeed in doing so.

When a whale is taking line from a boat, the utmost care is taken that it runs clear, as, should it become entangled and not instantly cut, the boat, and all it contains, would at once be drawn beneath the sea. Many fatal accidents have occurred to whalers from being themselves entangled in the line, drawn from the boats, and seen no more. In order for the whale to get no more line than is absolutely necessary, a strong piece of wood, called a *loggerhead*, is firmly fixed near the boat's stern; round this a turn or two of the line is taken, and it flies so swiftly round, that its friction would set the loggerhead on fire, if water were not occasionally thrown on the line.

Whales, when attacked, are generally passive, suffering the boat to approach, and the harpoons and lances to pierce their huge bodies without making a show of resistance, though serious accidents often happen, merely from the spontaneous movements of a wounded whale.

Boats in this way are often so badly stoven as to be rendered totally useless, and are abandoned on the sea. But they are not all thus unresisting; occasionally, a large warrior whale is encountered, which proves himself a formidable and dangerous antagonist; that, with a single blow of his ponderous tail, severs the boat from which he is assaulted quite into halves, often to the destruction of part of its crew. But the terrible jaw of such a whale, set with a couple of score of large pointed teeth, constitutes his chief arm of defence, and woe to the thing in the shape of a man or a boat with which it comes in contact.

Naturalists, in their closets, often make ridiculous mistakes in describing animals that are found in regions where they never venture themselves. Thus of the ——— and whale. "Both want *teeth* for chewing, and are obliged to live on insects." Again: "The whale pursues no other animal; leads an inoffensive life; and is harmless in proportion to his strength to do mischief." (*Goldsmith's Natural History.*)

Sperm whales are not so gentle; the large males often encounter each other so furiously as to break off many of their teeth when the jaws come in contact; and they have been taken with their jaws broken. Instead of fleeing, a warrior of this mettle resolutely maintains his ground, and even in turn becomes the assailant, chewing in pieces every boat that approaches him. These desperate whales, after much hard fighting and imminent danger, are sometimes conquered; but so obstinately and so successfully have they been known to defend themselves, that instances are on record, where all the boats of a ship, save one, to convey the drenched crews back, have been chewed into atoms, and the whales themselves, after defying all the resources of art, and disdaining to flee, have been left in full possession of the field of battle. We have heard of more than one case, where, as a *last resort*, the ship herself has been run alongside of a whale like this, and while passing by, lances were so skilfully thrown, that he ultimately died of his wounds, and

became at last a prey to his captors. But an attack in this way is certainly hazardous, as all will agree who remember the fate of the whale-ship Essex.*

The sperm whale is remarkable for yielding the unctuous substance, whence comes its name; and it is also remarkable for producing ambergris; the bowels of a sperm whale forming the only situation where this singular fragrant substance is generated. Whether its existence is a cause of, or the effect of disease, is not yet known; it rarely occurs, not perhaps in one whale out of a thousand.

They seem to be more migratory in their habits than other whales, occurring in every parallel of latitude between the two polar seas, down to an equatorial one; though generally preferring the deep blue sea that indicates unfathomable depths.

As they are thus widely scattered, they are searched for in almost every sea, however remote; and hence it often occurs, in voyages of three or four years' duration, that ships, before completing their cargoes, entirely circumnavigate the globe. They are occasionally seen in the Atlantic and Indian Oceans; but are found in greater abundance in the Pacific, where they are seen at times in favorite spots, scattered over the whole extent of this great sea. When, half a century ago, our ships first ventured into the Pacific in quest of sperm whales, the coasts of Chili and Peru abounded in them; and our hardy pioneers in this daring occupation, were there enabled to fill their ships, without the necessity of penetrating farther. But the whaling fleet increased extensively; the persecuted whales were in a measure killed and driven from their haunts; so that later voyagers, to insure success, have been compelled to push their adventures into still further and comparatively unknown seas. One unexplored track after another has been traversed, until it may now be said that, from Chili to New Holland, from California to the Japan Isles and China Sea, with the whole intermediate space—in a word, over a square expanse comprehending above eighty degrees of latitude, and more than one hundred of longitude, there is scarce a spot of any extent but what has been furrowed by the keels of a whaler, and been a place of privation to her enduring crew.

Zoologists have classed these animals, as well as the sporting tribe, among fishes, distinguishing them by cetaceous order, comprehending a variety of species. But on an examination of their structure and functions, the impropriety of this classification is manifest; and the inspector is at once convinced of their being far removed, or in fact wholly distinct from any species of fish. They have many analogies with the larger land animals, having, in common with them, warm red blood flowing through the system, though a certain modern philosopher has asserted to the contrary; Robert D. Owen, in one of his published letters, while in America, skeptically comparing his situation in a stage-coach to that of Jonah in the whale's belly, asserted that the whale was a "cold-blooded animal."

They have a heart, with auricles and ventricles through which this fluid is propelled; they have lungs, together with all the functions for breathing atmospheric air, and they can only suspend this breathing for an hour or two at a time. Being entire tenants of the deep, and having organs for propelling them through

* This ship was attacked and sunk by a whale; the mate and part of the crew, who took to their boats, were brought home from the Cape of Good Hope in the U. S. ship Vincennes in 1829, in which ship I was then serving as midshipman.—M.

it, are the only fish-like qualities they possess. They seem to form a sort of intermediate and connecting link between *absolute beasts*, and their more near submarine neighbors.

It is highly creditable to the spirited and enterprising individuals, who have put forth their capital in ships, destined to traverse the deep in quest of these oily monsters, that they have become so numerous as to form a large and important portion of our navigation; and this, without ever receiving, without ever needing legislative encouragement. A computation roughly made, shows that we have now whale-ships enough, if placed in a direct line, equidistant, and just in sight of each other, to form a continued fleet, that might reach more than half way around the globe. The wealth drawn out of the deep, and conveyed by them annually to the shores of America, is immense. But aside from contributing thus largely towards our national wealth, no small degree of honest pride arises from the knowledge that no nation can rival us in this perilous branch of industry. The English have, it is true, been for many years engaged in it, and with partial success, but the immense amount of bounty paid by their government to encourage the establishment of one branch of whaling alone, shows how reluctantly they have been drawn into it, and fully justifies us in saying that, in this pursuit, as in others that call forth daring energy, Old England must yield the palm to *New England* adventurers.

From the commencement of the whaling career of the English in the northern seas, down to the year 1786, that government had paid bounty therefor, amounting to £1,266,000, a fraction or so of the national debt. To insure success in their whaling operations in the South Seas, the English, as well as their neighbors across the Channel, have not scrupled to secure for their ships, masters, and other chief conductors of whaling voyages, from the young country that first led the way beyond the two fellow capes, in this great marine enterprise. So liberal, in fact, were the inducements held forth, that merchants as well as seamen removed from our own to their countries, invested their funds, and became actively engaged in this venturesome pursuit. So far as we know, a detailed description of the manner of capturing, cutting in, and trying out a whale, has never been given. The following may, therefore, supply the place of a better one.

It may first be mentioned, that when a whale-ship leaves her port, a man is stationed in the top-gallant crosstrees of each mast to look out for whales, and the mastheads are kept manned from daylight until sunset, during all weather that admits boats to leave their ship, from the time of her leaving home until her cargo is completed, or the voyage terminates; the ship's company standing watch aloft by turns of two hours each. When the spout of a whale is descried, the discoverer immediately makes it known by the welcome, and, on board a whaler, the well-known exclamation of "There she blows!" which is repeated often, as the spout appears in view; and though it should be so far off as to be but just discernible, yet, by its peculiar formation, as well as by the number of times and regularity with which it appears, the experienced eye of a practical whaler can distinguish at once from what species of whale the spout proceeds. If it be a sperm whale, and not to windward, the ship is instantly headed for it, and all sail made in pursuit. After some few preliminary observations, such as noting time by watch, and with a spyglass tracing the animal's way through the sea, its course and rate of going are ascertained, and it now may be calculated for with tolerable precision.

The ship is usually run within a half mile or so of the spot where the whale is expected to appear, when it rises to the surface; and by having the courses hauled up, and one of the larger topsails hove back, she there remains nearly stationary. The boats are now sent off, and are rowed in different directions, so that, if the whale is not going fast, at least one of the boats is nearly sure of being near him when he rises; or, should he chance to come up a mile from the boats, they can generally reach him before he has his spoutings out; as this occupies some fifteen minutes, and the boats may be rowed at the rate of six miles an hour, even over quite a rough sea. If the whale be slow in his movements, the boat's crews have nothing to do, while waiting for it to appear, but to lay upon their oars; and as the time draws nigh, eager eyes scan all portions of the sea around, to catch the first glimpse of a rising spout. But if there happen to be much swell, from the depressed condition of the boats, being often in a cavity between waves that entirely obstruct the vision, it is difficult to discern a spout from boats beyond a limited distance; in this case, the main dependence is placed on the man at the ship's masthead, who, as soon as he sees the whale, runs up a signal and points out its direction. This creates a scramble among the crews, as there is generally no small share of rivalry existing among them, and all strain every nerve with the view of being the first who approach and have the honor of first implanting their harpoons in the whale; but, as the boat which is more favored by chance, or happens to outrow the others, gets within a few yards of him, the contested race is given up, and the sternmost crews cease rowing, and silently await the issue of the first conflict. Sometimes boats approach a whale, as their situations chance to be, by rowing up towards the head, and get to the pervious part of its body in this way; at other times they proceed direct to its side, but generally the most approved way is to row up from behind, and, if necessary, make a circuitous route to do so. The approach of a boat often alarms a whale, when he dives beneath the sea and suffers it to come near him no more; but, more commonly, and especially on new grounds, where they have been but little disturbed, there is no difficulty in placing boats sufficiently near whales as to leave them in the attacker's power. It is probable, however, that boats seldom arrive near whales without their knowledge, such only making efforts to escape as have learned to regard them as enemies by having become acquainted with the missive weapons thrown therefrom. The harpooner rows at his oar until the boat gets nearly "within dart," when he is called up by the officer who steers and controls the boat; and when within a few feet of the whale, the progress of the boat is checked as much as possible by strokes of the oars. The harpooner now darts his two harpoons, which pass through the blubber and enter the fleshy mass that incloses the bones of this great animal; and these keen instruments coming in quick succession, often give to the affrighted whale the first intimation of impending danger. This is always a moment of peril to the assailants, and, therefore, one of anxiety to the lookers on; as some fearful accident might proceed from the convulsive motions of the wounded whale, other boats promptly row up to assist the first. The skill and activity of every one are now in requisition, lest the yet slippery and valuable prize should by some means escape before receiving his death wound. If, as often happens, a boat is badly stoven in the first outset, another takes in the immersed crew and tows the stoven boat to the ship, while others make a fresh and combined attack on the whale, which may now be rolling in the ocean foam that his own struggles have produced, or, perhaps, rearing its

mighty tail in the air, and drawing it down on the sea with such force as to make it resound to a great distance.

Soon as a boat is attached to a whale, the officer in charge exchanges situations with the harpooner or boat-steerer, as he is more generally called, the latter now steering the boat while the former goes forward and plies his lance, taking care to poise it well before throwing it, and to aim it always so that some portion of the whale's vitals shall be pierced. Copious emissions of blood then gush from the spout-hole, rise up a few feet, and fall into the sea, dyeing it with the crimson fluid wherever the animal pursues its way. Where a whale has fairly received its death wound, there is but a small chance for escape, as it seldom lives above an hour or so afterwards. When dead, a hole is cut in the head or tail, through which a rope is rove, and if the ship is to the leeward, the boats tow the whale towards her; but if the ship be to the windward, this labor is saved, as she then runs down within a short distance of the whale, where the foretopsail is hove back, the whale is hauled alongside, and a cable of rope or chain put round its tail. Preparations are now made for cutting in the blubber and other oily portions of the whale.

This is a laborious process, which, for a large sperm whale, requires the principal part of a day to complete. The cutting operation is performed from stages suspended over the ship's side; the cutters being provided with sharp instruments for the purpose, called spades; these have a razor-like edge of fine steel, and are affixed to poles of convenient length. To make a beginning, a small hole is cut first in the blubber near the head, and into this is placed a blubber-hook, to which is attached one of the two large tackles employed in hoisting in the blubber, and by means of the windlass, a piece of blubber about six feet in width is thus raised up to the ship's side. As this goes aloft, the whale rolls over and over, the blubber peeling off rapidly as it rolls; and as the cuts are made not quite circularly round, but in a direction somewhat obliquely towards the tail, the whole blubber comes off the whale in one continued piece, being stripped off in the spiral way from head to tail. With the aid of the windlass, this piece of blubber is heaved some thirty feet above the deck, when the lower block of the tackle meets the upper one, which is suspended from the main masthead; a second tackle then relieves the first, having a strap of the block inserted through and secured to the blubber near the deck; just above this block the blubber is cut off; the piece separated forming what is termed a *blanket-piece;* this is lowered into the *blubber-room*, which is that portion of the ship between decks, directly abreast and beneath the main hatches; another piece goes up to the same height as the first, and is in the same manner cut off and lowered into the blubber-room, and so on till all the blubber is taken from the whale, five or six of these pieces commonly taking the whole. The carcass is then abandoned to the ravenous sharks and hungry birds that surround a ship on these occasions. The carcass sometimes floats, but most commonly sinks.

While the whale is being rolled, the head is cut off; and it remains alongside secured by a strong rope till the blubber is hoisted in.

Small whales' heads are heaved on deck whole, but the immense weight of a large one renders it impracticable; it is therefore necessary to divide it. Both tackles are firmly hooked to a portion of the head denominated the junk, and this, when cut off, requires the united strength of the whole ship's crew at the

windlass to heave it high enough to reach the deck, a large one weighing at least between five and six tons.

The last and most remarkable portion of the whale remains yet to be hoisted in. This is what whalers term the *case;* it is a body of fluid head matter that often amounts to twelve or fourteen barrels, which, when removed from the head, leaves a large tubular cavity that runs longitudinally its whole length. It is inclosed by a cartilaginous substance that yields no oil, and this again has an outer covering which is of an intermediate nature between blubber and a singular part of the whale called *whitehorse*, which contains no oily matter, and is impervious to all but the keenest instruments—a cannon ball would hardly penetrate it. The part containing the case is also too unwieldy to be taken in whole, and to subdivide it would cause a loss, as much thin oil would escape; hence it is necessary to raise it with the cutting apparatus perpendicularly up the ship's side, with its lower end remaining in and supported by the sea. A perforation is then made in the upper end with a spade, and into this a bucket is placed which requires to be pushed down with a pole in order to tear away the tender membranous filaments that oppose its way; the bucket is then filled with oil, and by means of a pully is hoisted up and emptied into a receiver. In this way ten or twelve barrels of the oily liquid are obtained from every whale of a large size. It is necessary that this oil should pass through the pots and be heated to prevent its becoming rancid, though it may be mentioned that while fresh it is perfectly sweet, and like other animal fats only becomes rancid through age. While fresh, it may be and is sometimes used on board ship for culinary purposes. A certain species of Yankee food called *doughnuts*, fried in fresh oil, occasionally adds variety to the homely and too often scanty board of the whaler. Next to the case, the junk contains, in proportion to its bulk, the largest quantity of oily matter; much of it yielding its own bulk in oil; and while it is being cut into smaller pieces, the oil exudes so copiously that it is necessary to stop up the scuppers, and bail it from time to time off deck. The blubber between decks is cut into small pieces so as to be conveniently transferable; these are called *horse pieces*, and in this form the blubber passes through the mincing operation. This is performed by drawing a long knife across or nearly through the pieces, cutting down portions from a half to three quarters of an inch thick; these are not entirely severed, but for the convenience of removal are kept hanging together somewhat after the manner of book leaves.

In this state the blubber is ready for the try-pots, into which it is transferred with a fork or pike constructed for the purpose. A hot fire is kept up under the pots, and in an hour or less a pot full of blubber has all the oil fried out; "the scraps," are then skimmed off; more blubber is put into the pots, and a sufficient quantity of oil is boiled therefrom.

The oil boiled off is poured into a copper cooler, and from thence it runs through a cock into a second cooler, and from this is bailed into casks which are placed about deck, and when the oil is perfectly cool, the casks are coopered and stowed away into the hold.

If the weather is fair and the sea smooth, a large whale may be fried out in about 36 hours, which gives an average of from 2 to 3 barrels an hour; and if the whale be uncommonly fat, the oil can be extracted proportionably faster.

The scraps, it may be stated, form a sufficient quantity of fuel for continuing the frying process; this goes on night and day, the ship's company being divided into two watches who perform duty alternately.

It is somewhat remarkable that, in this age of invention, there has been no new method devised for capturing whales; nor any improvement made on the old one, nor yet on the simple instruments used against them.

The plain harpoon employed by the early whalers, is still in use, although there have been various modifications of this form; such as harpoons with one flue, those with joints, others barbed, &c. &c. But these have all had their day, and given way to the plain primitive harpoon.

There have indeed been some curious, but theoretical rather than practical, machines constructed for *shooting whales*, and also fanciful contrivances designed to explode in the animal, and blow it up. But nothing has yet been fabricated for sending a harpoon, that is at all comparable to a pair of nervous and dexterous arms, more especially if these happen to belong to a stout heart. That, however, a portable piece of mechanism can be put together which will fully answer the end of throwing the missive weapon, and destroying the whale with less risk of human life than the means now employed, is undoubtedly within the bounds of possibility. The chief difficulty, however, seems to be that of constructing an engine of this sort, which shall possess sufficient projectile force to enable the *shooter* to remain secure in the distance, and yet be of diminished size and weight, so as not to occupy much space, nor add materially to the weight of a boat.

Whaleboats are necessarily nutshells of fabrics, there being not a board in one, from the keel to the gunwale, that measures one-half inch in thickness, and this of the lightest material.

From Capt. Crocker to Lieut. M. F. Maury.

If the following will be of any use to you, it is heartily at your service; if not, I trust your fire burns brightly, and I know that your *patience* has been already proved.

For being so backward in furnishing my mite to your stock of materials, I have need to apologize, as, at this late period to have just become acquainted with "Maury's" indefatigable labors, and their splendid result, is a disgrace to all American shipmasters.

In 1848, I returned from a long whaling voyage, and in a few days after, started again upon another; and during the interval, obtained but a very imperfect knowledge of the uses to which the *abstract log*, I was requested to keep, would be applied. I kept it, however, in an imperfect manner (though it was correct as far as it went), and, on my return, duly forwarded it (from ship Mary Edgarton, arrived Nov. 1851). My avocations since that time have excluded me from all knowledge of nautical affairs until within the last few months, when I took the ship Massachusetts, merchant ship, from New York to Europe; this opened the way to a more perfect knowledge of your surprising discoveries, and made me desire to furnish *my* mite in return for the many benefits I am sure to receive, now that I am again "doing business upon the mighty waters."

The sickness and death of a beloved wife during the passage out, and the sinking of my ship on my

attempted return, will, I conceive, be my excuse for neglecting what I hold to be the duty of every shipmaster under ordinary circumstances, viz: to furnish a complete abstract of all that occurs during a voyage. I intend in this to give you some account of the two whaling voyages before mentioned.

In Nov. 1845, I sailed from New Bedford in Capt. McKenzie's old ship, the Minerva Smith, for South Georgia, the large island west of Cape Horn, in search of right whales. We arrived there in January, and found but *one*, though we stayed there a month—but we found there, in great plenty, a kind of whale different from any I ever saw before, and resembling, somewhat, the kind called "bowheads," by your correspondents; they were very large (would make two hundred bbls.), very smooth, and black, and very wild. They had a small hump, which appeared only when "turning flukes." We could not take one—for, three days before we arrived at the island, we were sailing through countless numbers of humpback; near the land, we saw very many ice islands, which drifted slowly towards the N. E. I also saw one very large sperm whale. We were *twenty days*, in March, 1846, beating westward into the track of ships bound round the cape.

During the months of July, August, and September, 1846, I was cruising in the Kamtschatka Sea, in a space not more than ninety miles square, the centre of which would have been the Island of Preobragima, (?) did it exist; but it does not, at least near the latitude and longitude where laid down, viz: lat. ——, long. ——. During that time I saw no ship (they were on the Kamtschatka shore that year), but plenty of whales, *such as they were.* We took *ten* of them, which made us only *five hundred barrels*, thus averaging only *fifty barrels* a piece—they were all *young whales;* for the blubber was thin, fine-grained and full of water, and the bone also was thin and short. *There were no full-grown whales there;* this appears to me a singular circumstance. Do the young right whales separate from the old at a certain age? and is it to get different food? The space they occupied was not more than sixty miles square—outside of that space none were seen. They left in September; moving suddenly to the southward, where I did not follow them. In October, we reconnoitred at the Bonin Islands, and then proceeded to cruise *between seasons*, off the Island of Morty, near Celebes, lat. ——, long.——, where we saw plenty of sperm whales.

In March, we got a few recruits of Yloylo, in the Isle of ——, one of the Philippines, and then passed northward, through the China Sea, towards the Sea of Japan. Proceeding northerly, we touched at the Island of Typinsan, the inhabitants of which appeared to be Chinese; they were polite and friendly enough, but would not suffer me to enter their town, nor to trade for refreshments. We met with just the same reception at Komsang, one of the Loo Choos, and at Harbor Island, a most singular and interesting island, which lies still further north, lat. ——, long. ——, and belonging apparently to the Japanese, as I saw people and vessels from Jeddo there. This island is shaped like a horseshoe—open to the westward, thus forming a spacious bay, free from rocks and shoals, and all around the sides of which are large inlets, forming admirable harbors, safe from all winds, and much more easy of access than the harbor at Bonin Islands, recently surveyed by Commodore Perry.

This island (Harbor Island) will be of great value to the future commerce that is sure to spring up between our western coast and China; for it is very near the route, and extremely fertile. The inhabitants

carry on a trade with Japan. The junks I saw there, from that place, were after sugar, large quantities of which I saw put up and ready for market. This island is much nearer our western coast than Luconia, where they now go for sugar, and from whence we must be shut out by Cuban troubles, or a war with Spain. I hope Commodore Perry will not overlook it.

Those junks were very curiously constructed, but you, perhaps, know more about them than I do.

In the Straits of Corea, we lay "off and on" the harbor of ———; while in a boat, I pulled in, to see if I could obtain the water and refreshments I had been so long seeking; but though it seemed a fine harbor, the inhabitants were not friendly, and I was obliged to pack on into the Japan Sea with a much shorter supply of those necessaries than I desired. I saw these junks from the coast of Tartary, loaded with fish.

North of the Basha Islands I am confident that whalers will be unable to find water or refreshments. Captain Potter's directions for entering the Japan Sea, through the Straits of Corea, are correct. Ships should not, however, borrow too much upon the Corea shore, as it is fronted with many small islets, and much discolored water. Daylight is very desirable in passing the narrowest parts.

I come now to what I wish most particularly to communicate; I am confident that mine was the first ship that entered that sea in search of right whales; and but two or three others entered that season—not enough to disturb the whales *much*. We may believe, therefore, that the whales acted naturally that season—that their migratory movements were the same as they had been always before.

How the whales got into that sea I am unable to tell; for, upon my arrival there in April, they were already there, and feeding diligently. I can only say I saw none in the Yellow Sea, nor in the Straits of Corea; I met them first about sixty miles northeast of the Straits, but they were not "regular," and I passed still further on into latitude ——, near the coast of Japan, where they were at home, and I commenced taking them rapidly. We cruised there and *off shore* until about the 10th of June, when I steered northwest, into latitude ——, near the coast of Tartary. Here we cruised until about the 15th of July, when it became evident that the whales were all moving quickly towards the northeast, and as that was just the direction of Perouse's Straits, it was not difficult to suppose the whales were leaving the sea, and I, of course, followed them. Two other ships, however, that I saw at the time, chose to remain, supposing they would "soon be round again."

On arriving at Perouse's Straits, I saw many whales, all moving eastward, and was confirmed in my opinion. It was morning when we left the Straits, with a good breeze blowing from the northwest, and seeing a whale moving rapidly and steadily towards the east, I determined to follow it, believing it would lead me at last to "good whale ground." All the day the whale moved steadily upon one course, at a speed of some six miles per hour, and I followed. At dark we shortened sail, and continued upon the same course until 12 o'clock, when we "hove to" until daylight; and true enough, at daylight next morning, we found ourselves in the midst of a fleet of ships which had come from the southward, and most of whom were "boiling." There were plenty of whales in sight, all of which were "at home." I learned afterwards that the "bulk" of the whales had been "set on" about a week before that time; the ships

there had done nearly nothing. My unique pilot had brought me to just the right place; for, during August, I "filled up," and left the sea, one of the first ships.

I thus demonstrated the fact that the whales, which had been found from year to year in the Ochotsk Sea after July, migrated there from the Japan Sea. Ships that entered the Japan Sea after the 20th of July found the whales. It has long been morally certain that whales *do* migrate, but never before to my knowledge have they been observed and *followed* from one place to another.

The winds in the Japan Sea were mostly from the southward, and the weather was warmer, and the sky clearer than in the same latitude outside. There was no perceptible current there, but in those days "Maury" had not learned us *how to observe;* we never thought then of trying the current, or the temperature of the sea.

One meteoric phenomenon observed there, is worth relating. We were about forty miles from the coast of Tartary, and had been enveloped in a thick fog several days, when one afternoon—as not unfrequently happened there—it suddenly cleared away, and the sun came out bright. The sky was clear, and the sea smooth, with a very light breeze from off the land, which *appeared* plain in sight; I say, *appeared*, for a close examination disclosed singular changes in the shape of various headlands, and thus we soon saw that it was a fog-bank; but with its upper edge as clearly defined, as hills against the sky. It was soon apparent that it was rapidly nearing us, and although there was very little change in the barometer, I became alarmed, and kept the ship before the wind, at the same time taking in sail. As it approached us, we could see it to be a perpendicular wall of dense fog, about three hundred feet high; it soon reached us, and with it a sharp squall (a whirlwind), with large hail and some rain. The bank of fog was not more than a quarter of a mile deep, and not near so dense upon the back side. This bank extended as far as the eye could reach, north and south, and after passing us, hung in the eastern horizon until nearly dark, when it melted away. It moved about sixteen miles per hour.

Contrary to most of the whalers that season, I came home through the China Sea, and around the Cape of Good Hope, touching at the Ladrone Islands, where we lay nearly a month waiting for the north-east monsoons. Had we been obliged to remain upon the whaling-ground until October, our passage home would have been shorter by many weeks, than that of any other ships. North of the —— in lat. —— I discovered an island upon which was a deposit of guano, and it has been suggested by a New York merchant, that it might be very valuable, and we think of an expedition there. You would do me a great favor by giving your opinion as to how much *rain* falls there. So much for my first voyage as master.

My next and last, was for sperm whales in the Sooloo Sea, Molucca Passage, and thereabouts. I was considered very lucky in finding them; perhaps I was, but I had read Wilkes on *Currents and Whaling*, and paid *attention to the temperature and currents.*

If I mentioned in my "abstract" a singular current of warm water, that I found setting westerly along the north coast of New Guinea, and a cooler one setting easterly upon the northern edge of the first, I think of nothing further interesting that I did not note there. The whole ground was in the warm current.

In the description of the sperm whale given by Capt. McKenzie and others, I am astonished to find they did not mention one of their most noticeable features. I refer to their *rugæ*, or the wrinkled appearance of the blubber. The right whale and all other spouting fish (or animals, if you please), except the humpback, which has the same *rugæ* upon its belly only, are singularly smooth and plump-looking; they have no uneven places upon them, and generally the epidermis is unbroken. They convey the idea of fat by their very appearance. The sperm whale, on the contrary, has a lean and shrivelled appearance, that would lead the inexperienced person to suppose the creature sick.

The ribs appear almost to protrude through the *apparently* thin covering, and the "black skin" or epidermis has a broken and chafed appearance, seen upon no other whale. In their convulsive struggles when attacked, large portions of this skin frequently drop from them, and, when dead, they have the appearance of having been violently rubbed against some hard substance. This appearance of leanness, however, is fallacious; for it is a common remark among whalemen, that, "the deeper the wrinkles, the fatter the whale." The head of the sperm whale is smooth, but from the eye to the fluke these *rugæ* extend without interval. They are not regular and running in parallel lines, but very irregular and broken. I can think of nothing to which the surface of a sperm whale has so great a resemblance as the surface of the ocean, when the wind has been very changeable. These *rugæ* are from one to three inches deep.

So far as these gentlemen went, their descriptions accord with my own experience. I remark, however, that I know nothing of a whale's ability to remain under water "*ad infinitum*"—I doubt it.

The whale grounds, where whales are supposed to exhibit this singular power, are, I believe, without exception, long, narrow strips, extending over but few degrees of latitude, but many of longitude; and in every case, there is good whale ground not far to the southward. Such shaped grounds *would* be occupied almost at once, were the whales from the south impelled to migrate in a body; and we have seen in the case of the whales in the Japan Sea, that large bodies of whales are thus impelled; and we saw, also, that they became "slow in their movements, and headed to every point of the compass" immediately upon their arrival at the new grounds—it is therefore much easier to account for their appearance on the whale ground "about the same day" in this way than to believe they go down to unknown depths, and stay for *months, fighting their battles*, &c., and living a life generally so at variance with their physiological structure.

It was not until lately that I became aware there were actually so many kinds of right whales existing; the fact, however, appears to be well established.

May there not also be more than one kind of *sperm whale?** We discovered a remarkable difference between the whales we caught in the Sooloo Sea, and those taken elsewhere; they were more thickly covered with *deep* wrinkles, and the head was differently proportioned; but the distinctive difference was in the *size* and in the *motion*. These were so marked that, at last, we were able to distinguish them when miles distant—and they obtained the name with us, of "Sooloo Sea Whales," in contradistinction to the common sperm. During the voyage we took fifty of them, which made us only *four hundred barrels*, thus

* Yes. "The Japanese," says Dr. Gray, in his work on the whale, "distinguish three kinds of sperm whale."—M. F. M.

averaging, male and female, only *eight barrels* a piece; while the common sperm *cows* average at least fifteen barrels. We saw the same kind of whale in the Straits of Macassar, the Flores Sea, and the Molucca Passage, and I was told by the English whalers, who had cruised in those seas many years, that they were to be met with in spots as far east as the Red Sea. Are they not a species peculiar to the East Indian waters? Such is the opinion of all those who have cruised long in that region. If this is a fact, what assistance will they render in tracing out the *currents* of that region?

Of those we took, many were females, whose udders were filled with milk, and which presented every other mark of maturity; there were also males with them, apparently full grown, but dwarfed in the same proportion. I never but once saw a *large male* among that species, and that one was evidently very old and sick, being large enough to make a hundred barrels, but actually making only sixty. When attacked, he immediately joined the others.

Not having seen your Whale Charts, I am not aware whether or not you know there is a little spot in the China Sea (Palawan Passage), about forty miles west of Louisa Shoals, where sperm whales are sometimes found in great plenty; they are not of the Sooloo species, but the common kind. Whales are also found in the western part of the same sea, further north.

If you desire a skull of the Sooloo Sea whale, or any other bone, I have friends cruising there, who would procure one if desired.*

In your valuable work, I notice that but very little is said concerning the longevity of sperm whales, and nothing at all about that of other kinds. Captain McKenzie (who is a good judge) thinks sperm whales live from forty to one hundred years—there can be no doubt but that they live at least as *long* as that; they have the appearance of being a long-lived creature; they are compactly built—their muscles are firm, and their organization generally superior to most of the warm-blooded fishes. We have reason to believe, also, that they are much longer in arriving at maturity, for we notice many more stages in their growth; the teeth, size, shape, and *deportment* of those we see, leave no doubt but that they are a number of years in attaining their full growth—I think as many as ten. With the right whales, however, it is different in every respect. I cannot believe them so long-lived, and we have means of *knowing* that they are not so long in coming to maturity. The right whale is much more loosely made, more *lymphatic*, decidedly, and they arrive at full growth in a surprisingly short time, considering their immense size. The (southern) right whale frequents bays and shoal water for the purpose of bringing forth its young; thus whalers, who seek them there, first see only full grown females, heavy with young; but as the season advances, find them accompanied with very young "calves," which, before leaving for "off shore," have already become large and seaworthy. These are met again "off shore," still with the mother, growing larger and larger as the season advances, until at the last part they are scarcely to be distinguished from the *males*, which, at that time, begin to couple again with the female. We sometimes meet with the bull, the cow, and the calf, all together.

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* They would be very acceptable.

I believe that the right whale attains to full growth in two or three years at most, and that their longevity is not more than *half* that of the sperm; and I infer that they do not produce young *every year*, from the fact that, although they always bring forth at one season, we meet them in different stages of pregnancy at the same time.

C. B. Chappel to W. R. Jones, Esq.—New London, October 25, 1849.

Having been requested to furnish a description of the Greenland whale and its habits, I comply with pleasure in furnishing what information my experience in the country will afford.

First, then, I will state that there are two kinds of whales in the Greenland seas, the first of which is found in latitude from 59° to 62° north, and invariably close to the ice, which at different seasons extends further to the eastward, sometimes as far as 55° of longitude west; but as the season advances from March, the ice gets broken and scattered in April and May. The whales seek their food and protection from rough weather among the ice, and always the heavier ice in preference; towards the land to the westward, and where there is no ice, they are seldom found and never at rest. The currents here set to the S. E. These whales have a long crooked head, perfectly smooth, with a very high crown or spout-hole; measure not more than 50 to 52 feet in length, having a small ridge or hump near the flukes, but not like the sperm whales or humpback. When the ice is gone, these whales seek the land, and go up the floe which runs far inland towards the west. The whales further north, in latitude 68°, near the Island of Disco, have no such hump, but their habits are the same. From Disco Island, the currents are found to set from the westward, which clears the ice from the land on the east side of Davis's Straits, and leaves water for the whales in this vicinity.

The current at the same time presses the ice over to the west side, barring the passage of the whales up Hudson Straits in the early part of the season; but after June comes in, the ice becomes more open, and the whales can pass through to the west land, where, in general, there is a strong land ice, in which, if there be no cracks or holes, they remain a short time in quiet. In the early part of July, whales are found to be going to the westward very quick, up Lancaster Sound, and in large numbers, where it is supposed, by all men that I have conversed with on the subject, that, if they meet no firm ice across the sound, they continue their passage either through Barrow's Straits down to Hudson Bay, or further to the north and westward through the unexplored regions. Some seasons they have been found, after going up Lancaster Sound and being gone for awhile, to return to the southward. From this we must suppose that the ice was so strong that the whales could migrate no further west, and the frost setting in, obliged them to seek a passage further south. When it happens that they come south, they keep the land, and generally at the mouth of some deep inlet seek inland again; and finally, when in September, if there is any ice in the straits, and any whales, we find them with the ice. We seldom find whales to the northward of Lancaster Sound in Baffin's Bay. But in former years it has been said they were quite numerous in latitude 76° 35′. Off Pond's Inlet, in latitude 74° N., longitude 76° 30′ W., we find whales coming from the middle of the straits; and if the land ice permits, they go directly up the inlet; if not, they remain awhile, then make up

the sound. In March, we find the old whales with their young in latitude 50° to 62°. In August, we find many young ones in latitude 74°, yielding from 50 to 60 barrels. The largest one that I have seen taken yielded 175 barrels, and 2,200 pounds bone. About whales stopping under the ice, I would say that they can at certain seasons stop beneath the water according to their own pleasure, or as nature, according to my own judgment, has created them to lay at bottom dormant for a length of time. I am strengthened in this belief by hearing the Governor of Disco relate the fact that he saw a whale lying at the bottom near the Harbor of Liefly, on Disco Isle, for seven weeks, and that he visited the spot each morning on the ice beneath which the fish lay for this length of time, and then arose to the surface and was captured. I do not remember at what season of the year this happened. What I have seen of the whales, their average length of stopping down is one hour and fifty minutes, and they remain above about twenty-five minutes; but when amongst the ice, we seldom see them more than two risings, and many times never see them after going down. When they are irritated by having the harpoon stuck into them, they do not stop down so long as when disentangled; and still, I believe I have seen a stuck fish stop down over two hours and come up apparently out of breath; and have seen them when I supposed they had made much exertion to pass under a heavy floe of ice, and, as they could not pass it, were obliged to return again completely out of breath. At such times, they are captured without a move to get away. I have seen a whale in a hole in the ice lay without going under for four hours; and, if not troubled, probably would have lain longer. It is my belief that these whales do emigrate to the west, and that there is a passage for them beneath the ice to seas beyond these sounds, or we should meet them oftener going the other way, which we never do. These whales do not require a large hole to breathe through; have often been found dead in the vicinity of Lancaster Sound, with no mark upon them, in numbers. From what I have heard, I believe them to be the same as the polar or Russian whale, but never saw one.

Captain Roys to Lieutenant Maury—Hong Kong, January 19, 1851.

I received your favor with pleasure, and am very willing to communicate any knowledge I possess respecting the whaling business. The whales of Behring's Straits and Baffin's Bay are the same; yet they differ very much from the Kamtschatka or northeast whale, or the right whale of the South Seas. I have known a whale to sound deep enough to take one thousand and fifty fathoms of line from the boat; yet I never knew a whale to remain longer under water than 35 minutes, of the right whale species; and one hour and 30 minutes for the sperm whale kind. I have never known them to sound under ice, that is, more than 30 feet above the water's surface, which was in the South Seas. I have never seen any ice to the northward of Behring's Straits more than 30 feet high. The right whale feeds upon a small animal substance, which seems to vegetate and come to maturity every year, and perish like the vegetation upon the land. And it is in only one state that the whale will eat it; consequently, in the northern hemisphere, in the month of January, the food is to be found from 30° to 35° north; and in February it is ripe for the whale; a little further in March; still further, and so on, until August, when it is as far north as the Kamtschatka whales go, which is 60°; while the feed from 35° to 40° becomes dead and unfit to nourish

the whale; consequently, the whale cannot live at that season in those latitudes; while the humpback and fin-back take possession, and seem to enjoy and revel in the food, after it has passed its stage for the right whale. The polar whale's feed differs a little from the others; and in January, may be found in 50° north, and in August, from 70° to the pole. I am firm in the opinion that the south is the same; but as no one has ever yet seen a right whale, the opposite of the arctic whales, in the antarctic, the matter still remains in doubt; and it is a lamentable truth, that the ships of war who have visited those seas are not able to tell us for certainty the kind of whales they saw there. It is not the easiest thing in the world to distinguish the different kinds of whales, even to those who have been in the whaling business, and a ship must be brought close by a whale to tell for certain his kind.

The sperm whale is found in all climates, and in every sea; he feeds upon an inanimate animal substance called a squid, which grows upon the bottom of the sea, and is never seen upon the surface, except when torn up by the whale. I have seen it in large pieces floating upon the surface. I have seen a dying whale vomit it up. I have opened the stomach of a whale and seen it there in pieces; which convinces me that the animal is very large, also, as well as small; and that the sperm whale almost always, when in want of food, goes to the ocean's bed.

I do not know as I shall be able to procure for you a whale's horn, as they are difficult to take; but, if no ill betide me, I will bring you the under and upper jaw of a Russian whale, which will be about 24 feet long by 16 diameter, which will serve to show the magnitude of this animal, and, perhaps, we may obtain the horn and something more.

I obtained the last season 3,200 barrels of oil, and 40,000 [pounds of] whalebone, which I shipped from here to England, and try my fortune another season. I commenced whaling in 1833, at 17 years of age, and it has been the whole study of my life ever since that time; and I am writing a book, with all the knowledge I possess, giving a particular description of all kinds of whales, with all my opinions, &c., which I will forward unto you upon my return to the States. I shall sail from here the 10th of February, and expect to be in 60° north on the 20th of March. It would require too much paper to send, by mail, full answers to your inquiries, and I can only say that I heartily rejoice that we have one man in our Government who will condescend to take notice of a business, the annual income of which is millions, and at the present time has broken down all competition of other nations, and is supplying the markets of the world with oil. I shall also be able to give you some of my opinions of ocean currents, &c. I have a set of your Wind and Current Charts, which, I am happy to say, I consider very useful, and have found them so. When I arrive at home, you will hear from me soon.

Captain Rose to Lieutenant Maury.

BARK DOVE, AT SEA, *June* 1, 1854.

DEAR SIR: Since sailing upon the present voyage of the Bark Dove, I have had sent to me, by owners, your *Whaling Chart and Notice to Whalemen*, published in 1851, and in conformity to your and their wishes, have kept an abstract of every day that I have been at sea. I have had no barometer or thermometer, and

have been unable to keep any record from them. If the abstract is worth perusing, it must be on account of the wind and currents, if anything. I did not get the notice until September, 1853, and have had no opportunity of making a drawing, or taking the dimensions of a sperm whale by actual measurement, having taken two large and no small ones since. I have made a rough draft of blackfish, which I will send you, and hope yet to have an opportunity of making one of a small sperm whale. The ones in the Sailing Directions I should hardly recognize as sperm whale, or blackfish, if they were not named. The sperm whale's head, on page 200, is good; also the whale, as he lays straight on the water, above; while the blackfish and grampus are represented without humps on their backs, which they both have; and the humpback without fins, although I know of no whale that has half so large fins, or is so rough about the head.

Fifteen years ago, I might have agreed with Captain Roys, that *sperm whales' feed* lived or grew on the bottom of the sea. And it may live there; but as to its never being seen unless torn up by whales, I know, and can support the assertion, that in some seasons and places it is seen on the surface of the water both alive and kicking. I have seen them often on the S. E. coast of Arabia, mostly in the morning, dodging across the bow and in the wake of the ship; have caught them several times, and need not describe them to you who are more of a naturalist than I shall ever be. When they spread out their side fins, or flippers, they resemble a skate, or diamond fish, except in color, which is grayish-white. They appear to have their stomachs charged with a black fluid, which, when, as they often are, attacked by the albecore, they spirt from their mouths, coloring the water about them for several feet. The albecore appear very cautious in approaching the squid; but half a dozen of them will sometimes tear the squid to pieces in less than a minute. The head and middle part of them they eat, leaving the side floating on the water, which the sharks do generally make quick work with. I have seen more albecore and bonita on this coast, in one day, than I ever saw on any other ground for months; and large albecore are considered as a good sign for sperm whale ground by many, or all whalemen.

As for the size of the squid, all I can say is, that I have taken from one, about three feet long, the squid's backbone, or, as some call it, the cuttlefish bone, about 6½ inches in length, and have found them as large in the stomach of blackfish and the cubs of sperm whales which would make six barrels of oil. I have seen the same by hundreds on this coast, floating on the top of the water, also on the shore of Juan d'Nova, and on Gloriosio Islands, and never saw one of the bones more than a foot long, from which I draw the conclusion that the feed of the sperm whale is not a very large fish or animal, or whatever you may call it.

I will, dear sir, trouble you with a few remarks upon what I have observed of the habits of the sperm whale, which I have been led to do more, since a feeling seems to have reached even to the city of Washington, that the American interest in whaling is worth looking after more than it was formerly —having commenced the business twenty-six years ago this month, and never been three months in the States but once at a time since 1828. I always went to the South Atlantic until 1841, making one voyage per year; since that, have been three voyages to Pacific and N. W. coast, never into the Arctic Ocean, and am bound home from my second one to the north part of the Indian Ocean. In 1850, cruised on the S. E.

coast of Arabia, from the latitude of 7° south to 3° north, from July until December; in 1851, from 1st of April until 1st of July; when full, went home and out again, as you may see per abstract; during the first voyage, saw but one large whale on or near the coast of Arabia, which we took, making 115 barrels; the present voyage, saw but two, of which we took one, making 105 barrels; so you will see that most whales that are found here are females, and their cubs; the old males that we saw and took were very still—I think more so than I ever saw them before, going no particular course, but slowly round and round when on the surface of the water, and staying down one hour and thirteen to fifteen minutes. Large whales generally, are moving two or three knots on some course; when we took one of them it was calm, as you will see from abstract, and having two whales alongside, and the blubber of three more on board; heard whales blowing before daylight; soon after sunrise, saw two of them so near the ship we did not lower until they went down; the next time they came up, struck and killed one of them, and I suppose that we might have got the other just the same, but we had more then than we could take care of; that was on the 27th of November, 1852, and we never took another sperm whale until July, 1853. Such is whalemen's life and whalemen's luck.

The females of school whales on the coast of Arabia, as I have seen them on what I call the inshore blue water, were either very still, or going slowly to N. E.; and to show that whales are sometimes on top of water without spouting, or throwing up a jet of air that can be seen for any distance, I will state that in August, 1852, in company with the barque Hope, of New Bedford, we were both standing on the larboard tack to the westward, in the forenoon, with about a three knot breeze, with an officer and three men aloft from each barque, and a first rate chance to see for a long distance, the Hope on my weather beam, about two miles distance, when we saw, from the Dove, a sperm whale's hump, two points on our weather bow, but could see no spout at all; thinking it to be a dead whale, lowered the boats, when the Hope kept for the direction that our boats were pulling, with every man on the lookout; and Capt. Robbins told me that he saw nothing from the Hope until one of my boats was in the act of striking a whale, although within a quarter of a mile, or less, of the whale; and I can safely say that in a minute there were more than fifty whales on the surface of the water, and that in five minutes there were six boats to as many different whales fast; so I think that may show that whales do not always show their spouts when on the surface of the water. I will state what I have seen to make me believe that whales do not always go to a great depth for food.

In August, 1851, being between 1° and 2° south, the land in sight to N. W., twenty-five to thirty miles distance; soon after sunrise, it being perfectly calm, saw a large spot, say from eighty to one hundred yards across it, about half a mile from the ship, where the water appeared of a very dark, muddy color, like albecore and squid engaged in fighting; after a while, saw what we called a sperm whale's jaw, and soon after, one's head, in the black water; lowered the boats and went there; saw nothing but now and then, the wake or whirl of water like the wake of whales; at last, saw one come up and roll her jaw out with a squid in her mouth; struck her, and in an instant there were four on top of water; killed them all, and saved three of them; but we never saw a spout from those whales until the harpoon struck the first one;

one of these whales had her jaw broken short off as far up as it could be of any use in biting her food, and yet was as fat as the others; they were all females, and appeared to have nursing cubs, although we saw but one cub with them, and him we killed, and he sunk.

Once, when I was first officer of a ship, we took a large whale, whose jaw was broken near the socket or joint, and his throat was very much swollen, so that I think he could not swallow; his head yielded as much oil as common, while his body blubber did not make half the usual quantity that it does generally.

If the sperm whales ever fight so as to break their jaws, I think it must be when they are under water; at any rate, I have never seen anything like a fight between them in all my fishing; yet there are few that have followed them up for many years but have seen them with jaws broken, and many scars about the head, but seldom on any other part of their bodies.

Where the sperm whales do cohabit together I do not know, as the large males are hardly ever seen with the females; sometimes a large one will be seen following a school, but I never saw but one amongst them this voyage; off the Amirante Islands I saw two males following a large school of females, but about two miles behind them; struck and killed them both; and their heads were lacerated apparently by each other's teeth, the wounds fresh as though just made; they yielded but sixty barrels, both of them together, although I have seen smaller whales make fifty barrels each.

N. B. Dear Sir: I made these rough notes that you may form your own opinion of the habits of the sperm whale, hoping that, after perusal, you may commit them to the flames; I profess to be no grammarian, and never expect to write a book to enlighten the public; but what I have written I have seen, and believe to be as correct as any others that I have heard heretofore. I know for certain that some have a different opinion, but I believe that the opinion expressed by Capt. McKenzie and Capt. Howland, that sperm or right whales can stop under water for days or weeks, to be correct; although some of the masters of ships in the whaling fleet may doubt it, and yet give no reason against it. Old Mr. Glass, the late Governor of Tristan d'Acunha, told me that he has seen a right whale lay apparently in a torpid state for seven weeks, in a cove at that island; and of any one who ever knew him, I have yet found no one who would doubt his word.

I think that a great deal more might have been found out about the habits of all kinds of whales, if there had been more attention paid to it. I have heard the master of more than one ship, this voyage, say that he would not believe that a ship could stay on the coast of Arabia, and get what they called a saving voyage; and have known more than one to try it, and getting once to leeward, get discouraged and give it up; yet I know and have told them they could work up again, and been laughed at for it; but let them laugh that win; I have got a full ship there once, and, with the same weather, believe it can be done again.

I remain, respectfully,

Your obedient servant,

CHRIST. L. ROSE.

Mr. Harens to Lieutenant Maury.

SAG HARBOR, *July* 14, 1854.

The brig Parana, Capt. Smith, sailed from this port on the 16th of June, 1853, for the South Shetland Islands, on a voyage for oil and skins, fitted for whaling, with a full complement of men, and outfit for two years. Mr. E. Smith, one of the owners, went in her as passenger and "man on occasion." He has kindly furnished me with the following statement, from his private journal, of the voyage—and, as I think you may find something of interest to you, I gladly embrace the opportunity afforded me of sending forward this small contribution in aid of the great work you are engaged in.

On the 17th of September following, arrived at New Bay, on the coast of Patagonia, where she found the ship Hudson, of Mystic, Capt. Cliff, engaged in bay whaling. The Parana remained at New Bay until the 24th of September, just one week; took two right whales, and saw quite a number; after leaving the bay, saw quite a number along the coast, proceeding southerly. On the 7th of October following, came to anchor in Port St. Carlos, at the head of Falkland Island Sound (F. I.); here she took on board 1,500 wild geese, shot by the brig's company; and, on the 13th of October, sailed for the South Shetlands, which she made on the 23d of October, having had a pleasant run out, with moderate, frosty winds; on the day she made the land, she brought up in the ice; remained shut in the ice, unable to reach the land, though frequently in sight, for five weeks; found the northern edge of the *ice* in lat. 31° 38′, long. 58° 22′; saw great numbers of *sulphur bottom* whales about the ice; made no effort to take them at that time, expecting to fill up with elephant oil.

On the 7th of November, discovered an island (not on the charts), *about fifty feet high and two hundred feet long*, in lat. 62°, long. 58° 34′. Capt. Smith has had much experience among the *ice*, and is confident he cannot be mistaken in marking this down a *rock*. (It may be so, but from its position I think it must be a *new rock*, or an island of *ice*.) On the 16th of November, experienced a severe S. W. gale of wind, of twenty hours' duration, in which the brig suffered in the loss of a new boat, and other damages; this gale broke up the ice, and, on the 3d of December, reached the shores of Elephant Island, where they found plenty of sea elephant, and for nine days were fully employed, and took 500 barrels of oil; after which time, took a few sea-leopards, but no more elephant. They remained about the islands until the 26th of February last, and wanting but about 250 barrels to fill, left for the Falkland Islands; came to anchor March 12, at Arch Island, off the south side of West Falkland; here they say large numbers of *hair seal*, but as they were not fat, thought they were not worth taking—in this they were mistaken; finding no whales, left for home on the 8th of April; took a sperm whale on the passage home, where they arrived on the 15th of June, 1854, one day short of the year.

Saw and struck a large sperm whale to the southward of 60° lat. in October, but did not save him.

During all the fine and pleasant weather at the South Shetlands, the barometer stood at the gauge mark *rain*.

The sea-leopards were all taken from off the ice. Saw quite a number of *fur seal* about Elephant Island.

In this stage of my investigations into the habits of the whale, I have thought it best to give the foregoing letters without any comments of my own. They possess much interest, and have a peculiar value. I quote them, not for the purpose of exciting discussion among naturalists, but for the purpose of eliciting further information from the whalemen themselves; hoping that these last will be induced to go more into detail, and give us all the information which they possess; and, among such a number of close observers, there is no doubt much to be elicited that is truly valuable. I need not add that naturalists would be thankful to any whaleman who will furnish them with a specimen of the so called hair with which we are informed by Captains Post and McKenzie that whales are covered.

Let us now return to the Whale Chart—letter F of the series.

By examining this Chart it will, in its present state, serve to satisfy one at a glance that the favorite haunts of the sperm whale are about the equatorial; of the right, about the polar regions. That near the tropics is a sort of debatable ground, where the pasturage of the one overlaps the pasturage of the other. And that, on either hand, a straggler from the one herd is occasionally found far over within the borders of the other.

I have to request that whalemen, when they come across these stragglers, will observe them closely. Do they appear to be lost? What is their bodily condition, fat or lean? and what the contents of their stomach? Are the stragglers generally male or female, and what is there that is peculiar about them?

The Whale Chart (series F), which comprises a chart of the world, Mercator's projection of 10 degrees to an inch at the equator, and which extends from lat. 79° 50′ N. to 68° south, shows three places where the sperm whale is in the habit of leaving the tropical regions and of resorting to higher latitudes. These places are in the South Atlantic, where they have been found in large schools, between the parallels of 30° and 35°; in the South Pacific, between the parallels of 35° and 60°; and in the middle of the North Pacific as high up as 40°.

I account for their presence up in the North Pacific by the Gulf Stream, which has its genesis in the Indian Ocean, and its exodus in the China Seas. It carries, high up into the North Pacific Ocean, the warm waters and sea climate of the tropics. And the sperm whale resorts there to enjoy it.

The sperm whale being found in the South Atlantic, has suggested the inquiry as to the temperature of the waters there. Can there be a warm current in that part of the ocean? If so, whence does it come? from the inter-tropical regions of the Atlantic, or from the Indian Ocean? or, is it a branch of the Lagullas Current?

If it be the temperature of the water which invites the sperm whale into these extra-tropical regions of the South Atlantic, we may perhaps obtain from these dumb creatures an answer to the question: By what channel do the waters which the ice-bearing current around Cape Horn, and the cold current from Baffin's Bay, and the waters which the Mississippi River, the St. Lawrence, and all the great rivers of Europe, Africa, and America, bring into the Atlantic Ocean—by what channel do these waters escape and preserve the level of the sea?

These currents bring into the Atlantic water more than enough to supply the waste of evaporation.

The brine of the sea is not accumulating or concentrating in this ocean, and we therefore *know* that there must be somewhere in this ocean, either at the surface above or in the depths below, a current of large volume running from it. I have searched for it long and patiently. I have looked for it—feeling as certain of its existence as we do of a thing that has been seen and known to exist, and is lost—but in vain.

The components of sea water, like the components of the atmosphere, are everywhere the same. It is true that we find a little more salt in this place, and a little less in that; but this is attributable, not to the want of a general system of aqueous circulation in the terrestrial economy, but rather to local causes, such as an excess of precipitation or an excess of evaporation, or the discharges of fresh water from rivers in the neighborhood. If the waters of the sea did not pass from one climate to another, and from one ocean to another, it would not be difficult to conceive why, in the process of time, there should not be as great a difference in the waters in different parts of the great oceanic reservoir of the earth as there is in the waters of the Dead Sea and the Mediterranean, or in the waters of any two seas between which there is no communication.

The chemist analyzes the waters of the Mediterranean and of the Red Sea, and detects the same components. Now, unless the waters of these two seas could intermingle—and I have traced a current from the one to the neighborhood of the other—unless, I repeat, there were an intermingling between the waters of these two seas, what could preserve the same salts in the same quantities in each?

The Red Sea, because it is riverless and rainless, receives no salts from the land on its shores. Whereas, the rivers which empty into the Mediterranean have for ages been filtering "the salt of the earth," taking it up in solution from the soil, and bringing it down with their drainage into this sea.

Now, unless nature had provided some means of process by which the waters of these two seas should regularly intermingle with the waters of the ocean, and, through the ocean, with each other, what would hinder the two seas from salting up their brine with different strength?

No doubt the harmonies of the sea are as beautiful and as sublime as the "music of the spheres." And to what agency, therefore, if not to the agency of currents and the mobility of water, must we ascribe the permanent condition of sea water? For perhaps of all parts of creation that are both tangible and visible to us, the waters of the sea are most permanent and stable in their characteristics, proportions, and constituents.

If nature had not provided a general system of circulation for the waters of the sea, what would prevent the waters of the Mediterranean, for instance, from absorbing salts and other constituents through its rivers, and of accumulating them in quantities and proportions, which would possibly make a characteristic difference between sea water from the Mediterranean and sea water from the Red Sea?

That the waters of remote seas do not permanently attain different degrees of saltness—that sea water, like the air of heaven, come whence it may, is always the same—may of itself be taken as a proof, if no other evidence could be had, that there is a regular and constant passage, secret and invisible though it be, of the waters from one oceanic basin to another. At least, in the present state of our information upon this subject, we infer that such is the case; and that it is owing to the agency of currents in the

depths below and on the surface above, that the waters of one sea are not all brine, of another all fresh, and of another all ice.

Twice, perhaps thrice, as much fresh water is discharged by the rivers of Europe, Africa, and America, into the Atlantic, as is discharged by all other rivers into the Pacific. Twice, perhaps thrice, as much fresh water is taken up from the Pacific as from the Atlantic by evaporation. Now, if the waters of these two oceans were never to intermingle—if the waters of the Pacific never found their way into the Atlantic, and if the Atlantic were never to send its waters to mingle with those of the Pacific Ocean in its own basin—what would prevent the great water-sheds that are drained into the Atlantic from filling its basin up, in the process of time, with fresh water? What, too, would prevent the Pacific, which gives more fresh water to the clouds than they restore to it again, from becoming, first, a sea of brine, then finally a bed of salt?

Studying the habits of nature, so to speak, with regard to the air and the sea, I have learned to conjecture that every drop of water now in the Pacific, has been at some former period in the Atlantic; and this conjecture, reason teaches me, is as plausible as is the supposition that every breath of air now in the northern hemisphere, has at some time or other, in following its appointed paths, coursed its round in the general system of circulation through the channels of the southern hemisphere.

Assuming these principles to be in conformity with the designs of nature, I have been induced to search for a current from the Atlantic Ocean to the Pacific.

Taking its existence for granted, therefore, as I am disposed to do, it can be readily shown that this current does not have its exodus through the Arctic Ocean; for in that case, the precipitation in that ocean being greater than the evaporation, the waters of the great rivers of Northern Asia, Europe, and America, being added to its own waters, would create a stream of immense volume and frightful rapidity through Behring's Straits into the Pacific. Whereas, so far from this being the case, the reverse occurs.

The current through Behring's Straits runs generally from, not into the Pacific. I have, therefore, looked to the South Atlantic—to the space between the two stormy capes—as the only place in which this ex-Atlantic current could make its exodus. And if, after all this special and minute investigation; if, after the most accurate, and careful, and patient examination that has been made of log-books here for some evidence of this current; if, after the attention of navigators has been called to it, and they have exhausted all the means which human ingenuity has devised for detecting and measuring currents at sea, and have failed to discover one here; if, after all this labor and research, it should so turn out, when we go there with the water thermometer, that the sea climate is not an extra-tropical one, as its latitude indicates; that it is the inter-tropical temperature of its waters which tempts the sperm whales to gambol there in such multitudes—then the discovery of the fact that the sea water here is a little warmer, and that, therefore, there is a current running hither from the equator, should be regarded as one which is due to the information which the study of the habits of this animal has given us. Plate XIX. leaves us to infer it to be an under current.

In the sperm whale region of the coast of Chili and Terra del Fuego, we have been taught to believe

in the existence of a cold current. Assuming this cold current to be there—that it is not crossed or divided by a warm current—the resort of the sperm whales there must be regarded as an anomaly in the habits of the creature.

These investigations as to the habits and places of resort of the whales, have taught me to regard sperm whales as much out of place in cold water, as the whalers themselves would regard out of place, a wilderness of howling monkeys of the Amazon among the Green Mountains of Vermont.

I take this occasion to say—because some of the whalemen have supposed it unnecessary to continue the abstracts when in sight of land—that it is important to have a complete abstract for every day they are at sea; that we may know whether they find fish or not, how plentifully, the force and direction of winds and currents, the temperature of the air and water, and that we may glean information as to all other phenomena which they are requested to note in the abstract log.

Plate XIII. is a section taken from the Whale Chart of the world. It is a copy, and nearly a fac-simile, except that, in some of the Charts, the right whale curves are colored blue, and the sperm, red. Take the square marked A, as an illustration and explanation of the Chart. Between the meridians of 45° and 50° W.—as between every fifth pair of meridians—are 12 columns for the 12 months; the first column on the left always standing for December, or the first winter month, the next for January, and so on.

Between the parallels of 35° and 40° are 11 horizontal lines. Beginning always at the south and counting up towards the north, each of the first ten of these lines stands for 10 days, thus making the 10th stand for 100. The scale is then changed; the 11th line stands for 200; and the 12th on the parallel of lat., for 300 days. (See the figures in the margin.)

Now, by following the curve for the days, and the curve for the whales, right and sperm, for this square—it will be seen that, during different years, whalers have spent in this square upwards of 100 days (125) searching for whales in the month of December; and that, out of this time, they saw right whales on 15 days—sperm on 2; and that during each month they have fished and seen as follows, viz:—

Days of Search.		No. of days on which were seen— *Right Whales.*	*Sperm Whales.*	Days of Search.		No. of days on which were seen— *Right Whales.*	*Sperm Whales.*
In December,	125	15	2	June,	12	0	0
January,	96	8	12	July,	8	0	0
February,	150	5	10	August,	28	0	0
March,	110	2	8	September,	68	20	0
April,	78	0	5	October,	90	25	8
May,	28	0	3	November,	88	43	5

It appears, therefore, that from September to December, inclusive, is the best time for whaling in this district of 5° square. In some of its neighboring districts, whalers have been more successful in other months, as a glance at the Chart will show.

It is worthy of remark that the sperm whale, according to the results of this Chart, appears never to double the Cape of Good Hope. He doubles Cape Horn. Since this fish delights in warm water, shall we

not expect to find, off Cape Horn, an under current of warm water, heavier with its salts? See the limits of the sperm-whale ground, as well as of the right, on Plate XIX. These are the approximate limits only of their most usual places of resort.

PHYSICAL CHART OF THE SEA.

There is contained, in the abstract logs kept for this office, a vast amount of information concerning various phenomena of the air and water.

This information may be called miscellaneous; inasmuch as it relates chiefly to subjects that, though interesting enough, yet do not constitute special objects of consideration; indeed, they are such generally as do not as yet come under any one of the various heads of research.

Among these, I may mention observations and remarks concerning gales of wind; notices of drift-wood, icebergs, and sea-weed; hail-storms, and tide-rips; flying-fish; colored water; phosphorescence of the sea, and the like.

The officers who are engaged in examining the logs and co-ordinating from them, are required each one to keep a memorandum-book by him, in which he notes and refers to all such subjects, when mention is made of any of them in the logs.

These little memorandum-books have suggested the idea of constructing a physical chart of the ocean, to illustrate some of the principal phenomena and subjects that are visible on its surface.

Each officer, as he examines the log for the special object which he has in view, is now to keep by him a blank chart, upon which he is to put down by symbols, ice, sea-weed, flying-fish, &c., in the place where the abstracts report them. Thus, it is proposed, should the results when grouped together be found sufficient, to construct what may be called, in some sort, a topographical chart of the surface of the ocean.

GALES OF THE GULF STREAM, TYPHOONS, &c.

Lieut. B. S. Porter has been engaged in constructing, for the last two years, Track Charts. During that time, and in the course of these labors, his attention has been called incidentally to the subject of storms as reported in the logs, particularly to the August storm of 1848, and to the September gale of 1852.

The abstracts afford quite a mass of information concerning these two gales, which he has carefully collected, and which, with some remarks of his own, was published at p. 303 *et seq.* 6th edition of this work. This chart of the gale (Plate X.) is characteristic, and I retain it as a type of a large class of storms. Mr. Redfield has traced out the track of a number of these storms in the Atlantic, as Mr. Espy has done with regard to those that take their rise on the land this side of the Rocky Mountains. Mr. Espy traces his to the sea shore; Mr. Redfield his to the Gulf Stream. In other words, it appears that many of the gales

which rise on the continent on one side of the Gulf Stream, and in the ocean on the other, make right for it, and joining it, travel along with it across the Atlantic.

That exhibited by Plate X. is a striking illustration of the sea gales. Those from the land require further investigation.

TYPHOONS.—The China Seas are celebrated for their furious gales of wind, known among seamen as typhoons and white squalls. These seas are included on Plate XVIII., as within the region of the monsoons of the Indian Ocean. But the monsoons of the China Seas are not five-month monsoons (§ 55); they do not prevail from the west of south for more than two or three months.

Plate I. exhibits the monsoons very clearly in a part of this sea. In the square between 15° and 20° north, and 110° and 115° east, there appears to be a system of three monsoons; that is, from northeast in October, November, December, and January; from east in March and April, changing in May; from the southward in June, July, and August, and changing in September. The great disturber of the atmospheric equilibrium is situated among the arid plains of Asia; their influence extends to the China Seas, and about the changes of the monsoons these awful gales are experienced.

In like manner, the Mauritius hurricanes, or the cyclones of the Indian Ocean, occur during the unsettled state of the atmospheric equilibrium which takes place at that debatable period during the contest between the trade-wind force and the monsoon force (§ 56), and which debatable period occurs at the changing of the monsoon, and before either force has completely gained or lost the ascendency. At this period of the year, the winds, breaking loose from their controlling forces, seem to rage with a fury that would break up the very fountains of the deep.

So, too, with the West India hurricanes of the Atlantic. These winds are most apt to occur during the months of August and September. There is, therefore, this remarkable difference between these gales, and those of the East Indies: the latter occur about the changing of the monsoons, the former during their height. In August and September, the southwest monsoons of Africa and the southeast monsoons of the West Indies are at their height; the agent of one, drawing the northeast trade-winds from the Atlantic into the interior of New Mexico and Texas, the agent of the other, drawing them into the interior of Africa. Its two forces, pulling in opposite directions, assist now and then to disturb the atmospheric equilibrium to such an extent that the most powerful revulsions in the air are required to restore it.

EXTRA-TROPICAL GALES.—In the extra-tropical regions of each hemisphere furious gales of wind also occur. One of these, remarkable for its violent effects, was encountered on the 24th of December, 1853, about three hundred miles from Sandy Hook, latitude 39° north, longitude 70° west, by the San Francisco, steam-ship (§ 152). That ship was made a complete wreck in a few moments, and she was abandoned by the survivors, after incredible hardships, exertions, and sufferings. Some months after this disaster, I received by the California mail the abstract log of the fine clipper ship Eagle Wing (Ebenezer H. Linnell), from Boston to San Francisco. She encountered the ill-fated steamer's gale, and thus describes it:

"*December* 24, 1853. Latitude 39° 15′ north, longitude 62° 32′ west. First part threatening weather; shortened sail: at 4 P. M. close reefed the topsails and furled the courses. At 8 P. M. took in

fore and mizen topsails; hove to under close-reefed main topsail and spencer, the ship lying with her lee rail under water, nearly on her beam-ends. At 1 30 A. M. the fore and main top-gallant-masts went over the side, it blowing a perfect hurricane. At 8 A. M., moderated; a sea took away jib-boom and bowsprit-cap. In my thirty-one years' experience at sea, I have never seen a typhoon or hurricane so severe. Lost two men overboard—saved one. Stove skylight, broke my barometer, &c. &c."

Severe gales in this part of the Atlantic—*i. e.* on the polar side of the calm belt of Cancer—rarely occur during the months of June, July, August, and September. This appears to be the time when the fiends of the storm are most busily at work in the West Indies. During the remainder of the year, these extra-tropical gales, for the most part, come from the northwest. But the winter is the most famous season for these gales. That is the time when the Gulf Stream has brought the heat of summer and placed it (§ 151) in closest proximity to the extremest cold of the north. And there would, therefore, it would seem, be a conflict between these extremes; consequently, great disturbances in the air, and a violent rush from the cold to the warm.

In like manner, the gales that most prevail in the extra-tropics of the southern hemisphere come from the pole and the west, *i. e.*, southwest.

ROUTES TO AND FROM EUROPE.*

The information contained under this heading relates to the best routes, under canvas, between New York and Europe.

The best average route, each way, as it regards the winds, independent of currents, is only indicated.

Upwards of thirty thousand observations on the winds in this part of the ocean alone, have been collated, compared, and discussed for these routes.

The routes now indicated are the results of this mass of materials, and these routes are to be looked upon as the mean or average track of all the vessels engaged in making the voyages which have afforded these observations, supposing that each vessel, under all circumstances and on every occasion, had made the most judicious courses.

My information is yet quite meagre in many portions of this part of the ocean, and the present routes should be regarded, not as fixed and final determinations; they are rather approximations.

Though they be approximations to those routes which further investigations, based on more ample materials, may establish as the best, their importance will no doubt be readily appreciated when it is considered that the average per centum of calms, head and fair winds, is stated for each district of 5° square of ocean through which the vessel is recommended to pass; and that they are so stated in the tables, and

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* Letter to Sec. Navy, Jan. 1, 1850.

exhibited on the Charts, the navigator, who pursues these routes and consults the authorities before him, will be freed from all doubt and perplexity which tack to take when the wind comes out *dead* ahead.

Upon a right decision in such cases often depends the success of the voyage, as to time.

I have now before me the log-books of two vessels, which afford a case in point; they were bound to Europe—were together, and had accomplished more than half the voyage; the wind came out ahead; one stood off to the northward on the starboard tack, the other to the southward on the opposite tack; one was right, and the other wrong; for, in consequence, one got into port ten days before the other.

In such cases, those who pursue these routes with the Pilot Charts on board, would be left in no doubt as to the tack having the greatest number of chances in its favor.

Permit me to call attention to a very remarkable part of the ocean through which these tracks pass. It is about 45° N. and 50° W. The water here is permanently cold; so cold that the water thermometer is sometimes found, within the distance of a few miles, to fall 40° of Fahrenheit; and I notice in many log-books the remark, "water, colored."

The spot is also remarkable for its fogs and its disturbed atmospherical conditions. If a vessel could be sent to examine into it, important service might be rendered to navigation, by showing how, when the heavenly bodies are obscured, the mariner may determine the position of his ship by dipping his thermometer into the water; or the examination might lead to other results not less important. It is probably the centre of great atmospherical disturbances.

There is said to be, somewhere along these routes, a rock just awash, and not known to any chart. The doubtful existence of such a danger is always perplexing and harassing to navigators; not knowing its exact position, they have to turn far aside out of the way, to be sure of avoiding it. The rock is small —only a few feet across—with bold water up to it. And because it is said to be in a part of the ocean that is so much frequented as is this, it is a matter of great importance to the mariner that all doubts as to its existence and locality should be removed. I have the reports of navigators who have seen it, and who have passed so close to it that they might have thrown a biscuit upon it. But its position is vaguely described.

I have received the following "Notice to Mariners."

"On the 2d Dec. (1849), the ship Marmion, Capt. Freeman, from Liverpool, when in long. 69° 29′ W., lat. 41° 05′ to 41° 01′, got in between two tide-rips, which broke. Capt. F. had been sounding 21 fathoms, and on steering S. by E. to S. by W. found as little as seven fathoms, which of course would be dangerous in blowing weather. * * *

"G. W. BLUNT."

And in addition the following has been published touching the same:—

NATIONAL OBSERVATORY, *February* 10, 1851.

SIR: Captain R. F. Hartshorn, of the ship E. Z., reports in his abstract log kept for this office, the discovery of a shoal in a much frequented part of the ocean, viz: near Nantucket Shoals, and directly in the route hence to Europe.

Extract from his log from Liverpool to New York, last July:—

"N. B.—During the two days, the 20th and 21st July, I was beating between lat. 41° 10′ to 41°, and long. 69° to 69° 40′; the fog very thick. Several times, I shoaled the water suddenly from 20 fathoms to 8 and 7—steering S. S. W. to S. by W. I am certain there must be a very shoal spot in the neighborhood of 69° 30′, or 69° 35′, and lat. 41° to 41° 08′. I had the lead constantly going during the 56 hours, and the soundings differed very materially from Blunt's Charts Soundings.

"I have sounded a good deal about Nantucket Shoals during the last eight years, and find the depths of water in the same places have changed more than I could have possibly believed; but it is a positive fact."

The place of this shoal is six or eight miles to the southward and eastward of Davis's Bank, discovered by the Coast Survey in 1846. It is possible that this may be the shoal reported by Captain Hartshorn; but doubt as to the existence of dangers in such a frequented part of the ocean, cannot be harmlessly tolerated. I therefore would recommend a careful examination of the locality.

Respectfully, &c.,

M. F. MAURY.

HON. WM. A. GRAHAM,

Secretary of the Navy.

These reports as to danger in this part of the ocean, led to an examination of this locality by the Coast Survey. The result was, thanks to Capts. Freeman and Hartshorn, the discovery of three shoals.—Vide *Coast Survey Chart: Davis's South Shoal and other Dangers*, 1852.

THE BEST AVERAGE ROUTES TO AND FRO BETWEEN NEW YORK, CAPE CLEAR, AND THE ENGLISH CHANNEL.

These routes are calculated from the Pilot Chart also; and they represent each for its month, the best track *on the average*, which a vessel can make.

The navigator who intends to follow any one of these routes, should lay it down on his Chart from the table; and when he gets thrown off of it by the winds and currents, as he often will, he should then, instead of turning out of his way to get back to it, recollect that if a special route were now calculated for him from his position, it probably would not touch the projected route at all. He therefore is in a new position, and must consult his Pilot Chart as to future courses and route. In recommending these routes, and in speaking of them, I wish navigators to understand and bear in mind *always*, that I am speaking from the information before me, which is sometimes imperfect and often deficient. When full and complete, it may modify present conclusions; present conclusions, therefore, must be regarded only as approximations.

If every vessel, whose log between this and Europe has afforded materials for the Pilot Chart, had always taken the most judicious course; and when she was headed off, if she had in every instance taken that tack which was really the best; and then, if a line had been drawn to represent on the Chart the

average or mean track of all those vessels for January, February, March, or April, and the other months, then that line would be represented by the route as given in the tables for that month.

In other words, the vessels that shall pursue the routes here given, will pursue exactly that course which the experience of all has shown to be the best on *the average*.

By consulting the Pilot Chart, or the column "Total No. of Observations," in the table of Routes, it will be observed that for the months for which the routes are given for European traders, I have not observations enough to the north of 45° N., and west of 45° W., to enable me to speak of the advantages or disadvantages of making that part of the ocean a greater thoroughfare than it is.

Take the route *from* New York in March for illustration: It will be seen by the table that the course recommended from longitude 55° to 50°, is east, and that the winds are from E. on *the average* 1.9 per cent. of the time, and that a vessel in steering E. there, would be headed off from her course by slant winds from the northward, 2.8 times; and by slant winds from the southward, 15.9 times in the hundred—and that these proportions are derived from the records of 108 vessels between these meridians in that month, or, which is the same, by 108 observations there, during the month of March of different years.

The south, therefore, is the windward side then and there; therefore these facts thus presented, will leave the navigator, when he comes to be headed off in that part of his route, in no doubt as to which tack to go upon; with the wind directly ahead or east, he should stand to the southward or to windward, because the probabilities of the wind's coming out from that quarter are greater than they are that it will come from the northward. At least such is the rule; it has its exceptions, and should yield to the rules of the storm when the occasion arises, and take that tack which safety and the march of the gale indicate as proper. I am not prepared, for I have not the materials, and if materials in sufficient quantity, not the force to go into a discussion as to the rules of the storm; and until the time for that discussion shall arrive, I refer the navigator to Piddington, Redfield, and other writers upon the subject.

Again, from the meridian of 35° to 30° W., the best average course is E. N. E.—1.3 per cent. of the winds are *dead* ahead, and 19 are slant from the northward against 4.3 from the other side. Here then it is shown, from the records of 80 vessels, that the northward is the windward side.

I have the records of two vessels which were together in this part of the ocean, on their way to Europe; they had kept together so far on their way; they sailed alike; when they arrived here, the wind came out ahead—one went off on the larboard and the other on the starboard tack; the latter arrived in port ten days before the other. With the Pilot Chart on board, it would have been impossible for the other vessel so to have mistaken the chances in favor of her proper course. Captain Hartshorn, of the E. Z., informs me that on his last voyage in 1852, from Liverpool to New York, he made these Charts his guide; that he made the most remarkable passage of the season (19 days), and that vessels which sailed about the same time he did, did not arrive for twenty days and more after he did. He attributed his success to the lights which the experience of others, expressed by these Charts, afforded him.

I have not calculated the track beyond 10° W. off Cape Clear for the Liverpool track; nor beyond 5° W. for the English Channel, because, beyond these meridians, the best course to steer is indicated by the land and the winds that happen to prevail.

ROUTES BETWEEN NEW YORK AND EUROPE.

BEST AVERAGE ROUTES BETWEEN NEW YORK AND LONG. 10° W., FOR VESSELS BOUND TO AND FROM LIVERPOOL; ALSO, BETWEEN NEW YORK AND LONG. 5° W., FOR VESSELS BOUND IN OR OUT OF THE ENGLISH CHANNEL.

New York to Europe.—JANUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
							SLANTS FROM					
			True.	Per cent.	Average.	Head.	N'd.	S'd.	Fair.	Calms.		
40° 28′	74° 00′	to										
40 28	70 00	E.	182	6.2	193	6.2	6.0	5.0	82.8	2.1	97	
42 02	65 00	E. N. E.	245	10.4	271	2.8	5.6	*w* 13.3	78.3	3.6	143	
43 33	60 00	E. N. E.	238	20.8	287	8.0	12.8	12.8	66.4	3.2	64	
43 33	55 00*d*	E.	217	4.2	226	0.0	*w* 11.0	4.4	84.6	4.4	94	
45 03	50 00	E. N. E.	233	14.4	266	4.8	*w* 13.2	8.4	73.6	8.5	89	
45 03	45 00	E.	212	11.4	236	0.0	14.3	14.3	71.4	0.0	7	
45 28	40 00*d*	E.	212	6.8	226	0.0	3.1	*w* 18.6	78.3	0.0	32	
45 27	35 00	E.	212	5.1	223	1.5	3.0	4.5	91.0	9.2	71	
46 30	30 00	E. N. E.	227	8.5	246	2.2	9.9	9.9	78.0	2.1	94	
47 55	25 00*d*	E. N. E.	221	5.6	233	0.0	4.8	*w* 13.2	82.0	7.0	92	
47 55	20 00	E.	201	8.1	217	1.5	9.0	*w* 12.0	77.5	3.1	67	
49 17	15 00	E. N. E.	214	2.2	219	0.0	1.4	*w* 8.4	90.2	2.8	74	
50 00	12 20	E. N. E.	113	6.3	120	2.1	4.2	4.2	89.5	0.0	43	} To
50 38	10 00	E. N. E.	98	15.1	112	5.8	*w* 13.6	2.9	77.7	1.9	105	} Liverpool.
			2825		3075							
49 17	10 00	E.	196	8.0	212	4.2	*w* 4.2	0.0	91.6	0.0	43	} To
49 36	5 00	E. ½ N.	196	24.9	245	8.3	0.0	*w* 41.5	50.2	0.0	12	} Channel.
			3006		3300							

New York to Europe.—FEBRUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.		
From 40° 27′	74° 00′ to											
40 45	70 00	E. ½ N.*	182	7.7	196	1.0	8.7	*w* 10.5	79.8	1.9	106	
41 42	65 00	E. by N. ½ N.	233	8.2	252	3.4	*w* 8.5	3.4	84.7	6.6	62	
43 13	60 00	E. N. E.	238	5.7	251	0.0	*w* 12.0	8.4	79.6	0.0	84	
44 42	55 00	E. N. E.	234	10.8	259	2.2	11.0	11.0	75.8	7.8	96	
44 42	50 00*d*	E.	213	9.0	232	3.3	*w* 12.1	3.3	81.3	2.3	88	
44 42	45 00	E.	213	7.4	228	0.0	*w* 13.0	8.0	79.0	2.9	105	
45 00	40 00	E. ½ N.	212	5.9	229	2.8	1.4	*w* 2.8	93.0	4.4	70	
46 26	35 00	E. N. E.	225	6.1	235	0.0	3.2	*w* 19.2	77.6	3.1	65	
47 50	30 00	E. N. E.	221	7.8	239	1.0	7.0	*w* 13.0	79.0	4.9	106	
49 13	25 00	E. N. E.	217	3.6	225	0.9	2.7	*w* 4.5	91.9	4.3	111	
49 13	20 00*d*	E.	197	10.3	216	3.0	8.0	8.0	81.0	4.0	103	
50 00	15 00	E. by N. ¼ N.	200	8.5	217	4.2	4.2	*w* 5.6	86.0	1.4	69	
50 50	10 00	E. by N. ¼ N.	196	11.2	217	3.6	5.4	*w* 16.2	74.8	3.5	118	To Liverpool.
			2781		2996							
49 30	10 00	E. ¾ S.	200	16.7	233	5.7	*w* 22.8	*w* 7.6	63.9	1.9	52	To Channel.
49 30	5 00	E.	195	9.9	214	0.0	16.6	16.6	66.8	0.0	6	
			2980		3226							

Average sailing distance to 10° W., by this route, to Liverpool, 2,996 miles, for 215 of which the winds, on the average, are *dead* ahead.

Average sailing distance to 5° W., English Channel, 3,226 miles, for 246 of which the winds, on the average, are *dead* ahead.

* Nantucket Shoals are in the way of an E. N. E. course, which would be the best.

New York to Europe.—MARCH.

Latitude.	Longitude.	Course.	DISTANCES. True.	DISTANCES. Per cent.	DISTANCES. Average.	WINDS; PER CENT. Head.	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.	Total No. observations.	
40° 27′	74° 00′ to											
40 27	70 00	E.	182	12.4	205	6.2	2.8	w 6.9	84.1	4.1	151	
40 00	65 00	E. N. E.	245	7.2	263	7.2	7.1	w 15.8	69.9	1.4	206	
42 45	62 30	E. N. E.	119	13.1	134	2.5	13.2	w 15.0	69.3	4.1	126	
42 00	60 00 d	E. S. E.	119	13.7	135	4.2	13.3	13.0	69.5			
43 31	55 00	E. N. E.	238	13.2	269	9.6	7.1	w 15.1	68.2	5.3	118	
43 31	50 00	E.	217	7.9	234	1.9	2.8	w 15.9	79.4	0.9	108	
43 31	45 00	E.	217	9.4	238	1.7	w 10.3	8.5	79.5	2.5	121	
43 31	40 00	E.	217	3.7	225	1.6	2.1	3.2	93.1	5.0	200	
43 31	35 00	E.	217	7.6	234	0.0	2.9	7.6	89.5	4.8	109	
45 00	30 00	E. N. E.	233	4.3	243	1.3	w 19.0	4.3	75.4	3.9	80	
46 27	25 00 d	E. N. E.	226	8.4	245	4.4	4.4	1.1	90.1	1.1	90	
46 27	20 00	E.	206	3.2	212	0.0	w 7.0	2.2	90.8	2.2	90	
47 52	15 00	E. N. E.	221	6.7	236	0.0	w 12.0	6.3	81.7	0.0	74	
50 00	11 45	N. E.	181	5.4	191	0.0	4.0	w 12.0	84.0	0.0	67	
50 44	10 00	N. E. by E.	81	10.8	90	5.4	6.0	w 8.4	80.2	3.5	116	To Liverpool.
			2919		3154							
50 00	10 00	E.	67	11.8	75	3.0	9.0	9.0	79.0	0.0	67	To Channel.
49 40	5 00	E. ½ S.	194	10.0	213	17.0	25.0	8.3	49.7	0.0	12	
			3099		3352							

New York to Europe.—APRIL.

Latitude.	Longitude.	Course.	DISTANCES. True.	DISTANCES. Per cent.	DISTANCES. Average.	WINDS; PER CENT. Head.	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.	Total No. observations.	
40° 27′	74° 00′ to											
40 27	70 00	E.	182	9.2	199	3.0	9.6	w 11.4	76.0	7.1	180	
42 00	65 00d	E. N. E.	244	12.3	274	3.2	8.3	w 11.1	77.4	2.5	161	
42 00	60 00	E.	223	12.7	251	5.2	7.8	w 9.1	77.9	7.3	88	
43 31	55 00	E. N. E.	237	7.9	256	2.4	6.4	5.7	85.5	4.1	126	
45 00	50 00	E. N. E.	233	5.0	244	0.0	w 9.9	w 7.2	82.9	10.1	120	
46 21	45 00d	E. N. E.	226	3.3	233	0.0	0.0	8.3	91.7	0.0	12	
46 27	40 00	E.	207	6.6	320	0.0	w 5.5	w 16.5	78.0	5.6	19	
46 27	35 00	E.	207	5.5	218	2.5	5.0	0.0	92.5	7.6	42	
46 27	30 00	E.	207	10.1	228	0.0	8.8	w 20.9	70.3	5.5	92	
47 52	25 00	E. N. E.	221	15.6	255	5.2	11.8	w 16.3	66.7	7.4	145	
49 14	20 00d	E. N. E.	215	12.9	242	4.2	6.7	w 10.9	78.2	5.9	125	
49 14	15 00	E.	196	8.8	213	3.6	w 13.2	3.6	79.6	7.5	86	
49 14	10 00	E.	196	4.6	205	1.1	1.1	w 7.7	90.1	0.0	89	
49 30	5 00	E. ½ N.	196	20.9	237	5.5	11.0	w 33.0	50.5	5.6	12	To Channel.
			2990		3375							
50 00	13 06	E. N. E.	79	4.0	82	1.1	4.4	5.5	89.0	0.0	89	To Liverpool.
Cape Clear	10 00	E. N. E.	130	3.6	135	0.0	3.6	3.6	92.8	0.0	80	
			2807		3150							

New York to Europe.—May.

Latitude.	Longitude.	Course.	DISTANCES. Direct.	Per cent.	True.	WINDS; PER CENT. Head.	North.	South.	Fair.	Calms.	Total No. observations.
Sandy	Hook to										
40° 27′	74° 00′										
42 00	70 00	E. $\frac{3}{4}$ S.	185	14.4	211	5.4	9.1	7.7	77.8	4.0	235
41 34	65 00	E. N. E.	246	10.2	271	2.7	11.0	6.8	79.5	7.3	281
43 06	60 00	E. N. E.	240	10.4	265	1.2	18.2	7.8	62.8	3.9	189
44 36	55 00	E. N. E.	234	8.8	254	1.2	4.3	11.0	83.5	3.0	170
44 36	50 00	E.	214	11.5	238	3.9	8.5	8.5	79.1	3.9	160
44 36	45 00	E.	214	7.3	229	2.2	7.6	6.0	84.2	4.8	195
44 36	40 00	E.	214	5.6	226	1.1	6.8	5.1	87.0	2.9	180
45 00	35 00	E. $\frac{1}{2}$ N.	215	4.3	224	0.0	5.3	10.1	84.6	1.5	136
45 00	30 00	E.	212	4.8	222	0.7	7.8	4.3	87.2	4.8	132
45 00	25 00	E.	212	5.1	223	0.8	6.4	4.0	88.8	5.6	131
48 25	20 00	N. E.	290	9.6	318	3.0	9.0	9.0	79.0	3.0	137
48 25	15 00	E.	198	11.5	220	2.9	10.9	10.2	76.0	3.6	142
48 25	10 00	E.	198	16.8	231	4.8	21.6	10.4	63.2	3.2	129
To Channel		E. N. E.	210	16.8	245	2.8	11.3	33.6	52.3	5.5	38
			3082		3377						
50 16	15 00	E. N. E.	212	16.4	246		8.7	8.7	75.3	3.6	142
To Liverpool	10 00	E. N. E.	194	14.0	221		4.4	13.2	79.1	1.1	96
			2882		3148						

New York to Europe.—June.

Latitude.	Longitude.	Course.	DISTANCES. Direct.	Per cent.	True.	WINDS; PER CENT. Head.	North.	South.	Fair.	Calms.	Total No. observations.
Sandy	Hook to										
40° 08′	73° 00′	E. S. E.	50	9.7	55	1.7	11.0	9.2	78.1	} 2.7	232
41 13	70 00	E. N. E.	170	8.7	185	1.8	4.8	10.9	82.5		
42 45	65 00	E. N. E.	241	8.5	261	1.8	3.5	3.9	90.8	3.5	235
42 45	60 00	E.	220	10.9	244	4.5	8.0	4.5	83.0	3.8	216
44 15	55 00	E. N. E.	236	8.5	256	3.3	3.8	7.1	85.8	1.1	184
45 43	50 00	E. N. E.	230	5.1	242	0.5	5.8	8.2	85.5	3.1	202
47 10	45 00	E. N. E.	224	5.9	237	2.3	0.0	6.8	90.0	0.0	44
48 33	40 00	E. N. E.	217	4.8	227	1.4	0.9	7.0	91.6	9.9	78
49 54	35 00	E. N. E.	212	10.7	234	3.1	5.0	11.9	80.0	3.1	165
51 13	30 00	E. N. E.	207	2.0	211	4.0	0.0	2.0	94.9	0.0	47
51 13	25 00	E.	188	0.8	189	0.0	9.0	2.0	98.0	6.1	52
51 13	20 00	E.	188	2.2	192	0.0	0.0	6.9	93.1	2.3	44
51 00	15 00	E. $\frac{1}{2}$ S.	190	15.4	218	7.2	6.0	4.7	82.1	0.0	82
50 40	10 00	E. $\frac{1}{2}$ S.	194	10.0	214	4.9	13.3	15.4	66.4	5.6	150
To Channel			209	5.1	219	3.9	18.2	1.3	76.6	0.0	78
			2976		3184						

According to the Charts, this is the best track yet developed, and ought to give the shortest passages.

New York to Europe.—JULY.

Latitude.	Longitude.	Course.	DISTANCES. Direct.	Per cent.	True.	WINDS; PER CENT. Head.	North.	South.	Fair.	Calms.	Total No. observations.	
40° 27′	74° 00′ to											
40 27	70 00	E.	182	12.0	204	3.6	7.2	5.1	84.1	4 2	322	Calms.
42 00	65 00	E. N. E.	246	5.0	260	3.0	7.0	9.1	80.9	8.7	414	Calms.
43 30	60 55	E. N. E.	237	4.2	247	0.9	3.3	4.8	91.0	8.4	350	
43 30	55 00	E.	218	10.3	240	4.4	5.6	8.0	82.0	5.6	263	
44 59	50 00	E. N. E.	233	5.9	244	0.4	8.8	7.6	83.2	5.4	236	
44 59	45 00 *d*	E.	212	12.6	238	4.4	8.1	8.1	79.4	8.1	173	
45 40	40 00	E. by N.	214	8.0	231	1.0	8.0	3.0	88.0	4.0	103	
47 06	35 00	E. N. E.	224	3.3	231	0.0	2.2	11.0	86.8	4.6	95	
47 06	30 00	E.	204	5.9	216	1.1	10.6	4.1	84.2	3.2	77	
47 06	25 00	E.	204	9.0	222	2.1	10.6	8.2	79.1	6.5	100	
48 29	20 00	E. N. E.	218	8.8	237	4.2	2.1	6.3	87.4	9.4	105	
49 50	15 00	E. N. E.	213	8.5	231	2.5	13.2	3.3	81.0	2.5	125	Liverpool.
50 30	10 00	To Liv'pool	195	13.4	220	5.7	5.6	9.1	79.6	4.5	92	
			2800		3021							
48 29	15 00	E.	198	5.8	209	2.5	5.8	0.8	90.9	2.5	125	Channel.
48 29	10 00	E.	198	17.8	234	6.5	17.5	3.2	72.8	2.2	94	
49 00	To Channel	E. N. E.	213	12.8	240	0.0	28.0	8.0	64.0	0.0	24	

New York to Europe.—AUGUST.

Latitude.	Longitude.	Course.	DISTANCES. Direct.	Per cent.	True.	WINDS; PER CENT. Head.	North.	South.	Fair.	Calms.	Total No. observations.	
40° 27′ *d*	74° 00′ to											
40 00	70 00	E. ¾ S.	186	13.0	209	3.0	9.5	18.0	69.5	6.0	194	
39 12 *d*	67 30	E. S. E.	125	8.7	135	3.1	2.9	10.7	83.3	3.6	229	
39 12	65 00	E.	116	6.6	123	1.6	17.0	7.1	74.3			
39 12	62 30	E.	116	8.0	125	3.0	6.5	5.5	85.0	4.3	193	
40 00	60 00	E. N. E.	125	7.6	134	2.0	9.5	5.0	83.5			
41 34	55 00	E. N. E.	246	7.1	263	7.1	7.0	8.4	77.5	6.8	157	
43 06	50 00	E. N. E.	241	11.1	268	3.0	6.5	11.0	79.5	6.5	213	
44 36	45 00	E. N. E.	235	14.3	268	4.8	12.0	12.6	70.6	3.7	166	
45 00	44 26	N. E.	34	9.4	37	2.8	4.5	11.2	81.5	5.0	147	
48 08	40 00	N. E.	260	7.	279	0.0	11.4	12.6	76.0	7.9	123	
48 00	35 00	E.	201	8.2	217	2.4	7.2	7.2	83.2	9.4	129	
48 00	30 00	E.	201	8.0	217	3.0	4.0	5.0	88.0	2.9	106	
48 00	25 00	E.	201	3.0	207	0.0	5.0	6.0	89.0	1.1	92	
48 00	20 00	E.	201	8.4	218	3.0	9.0	1.5	86.5	7.8	69	
48 00	15 00	E.	201	3.0	207	0.0	8.0	2.0	90.0	4.2	100	
49 22	10 00	E. N. E.	214	3.7	221	0.8	11.2	0.0	88.0	3.2	130	Liverpool.
49 30	5 00	E.	195	5.0	205	0.0	5.1	8.4	86.0	0.0	36	Channel.
			3098		3333							

New York to Europe.—SEPTEMBER.

Latitude.	Longitude.	Course.	DISTANCES. True.	DISTANCES. Per cent.	DISTANCES. Average.	WINDS; PER CENT. Head.	WINDS; PER CENT. North.	WINDS; PER CENT. South.	WINDS; PER CENT. Fair.	WINDS; PER CENT. Calms.	Total No. observations.	
40° 27′	74° 00′ to											
40 00	72 35	E. S. E.	71	5.4	75	0.0	9.9	5.4	84.7	4.5	115	
40 49	70 00	E. N. E.	128	15.3	147	0.9	30.6	9.0	59.5			
40 49	65 00	E.	227	10.4	250	4.2	9.0	3.6	83.2	5.3	178	
40 49	60 00	E.	227	15.5	261	6.3	13.3	4.9	75.5	5.3	159	
42 22	55 00	E. N. E.	243	5.6	256	0.0	13.8	5.4	80.2	3.7	167	
42 22	50 00	E.	222	16.3	257	6.0	14.4	9.6	70.0	6.2	172	
43 53	45 00	E. N. E.	237	15.0	272	4.9	11.2	14.0	69.9	5.8	147	
45 22	40 00	E. N. E.	232	9.8	255	4.2	8.4	4.2	83.2	2.2	138	
46 48	35 00	E. N. E.	225	8.9	245	2.6	9.1	7.8	80.5	1.3	78	Liverpool.
48 12	30 00	E. N. E.	220	4.7	229	1.2	6.3	5.1	87.4	6.2	85	
49 35	25 00	E. N. E.	213	4.2	222	0.0	9.0	5.0	86.0	8.0	109	
49 35	20 00	E.	192	12.2	216	3.6	11.7	15.3	69.4	0.9	111	
50 33	15 00	E. by N.	201	7.6	216	1.8	3.6	19.2	75.4	1.8	64	
50 33	10 00	E.	191	12.8	213	3.3	7.7	17.6	71.4	1.0	96	
			2830		3114							
45 22	35 00	E.	211	9.9	232	3.9	5.2	6.5	84.4	1.3	78	To Channel.
45 22	30 00	E.	211	5.3	222	1.3	2.5	8.8	87.4	6.2	85	
46 48	25 00	E. N. E.	225	4.2	234	0.0	9.0	5.0	86.0	8.0	109	
46 48	20 00	E.	205	12.2	230	3.6	11.7	9.0	75.7	0.9	111	
48 12	15 00	E. N. E.	220	11.4	245	3.6	2.4	9.6	84.4	1.2	81	
48 12	10 00	E.	200	14.8	230	3.6	21.6	5.4	69.4	1.8	57	
49 34	5 00	E. N. E.	213	15.0	245	0.0	10.0	40.0	50.0	0.0	20	

Europe to New York.—JANUARY.

Latitude.	Longitude.	Course.	DISTANCES. True.	DISTANCES. Per cent.	DISTANCES. Average.	WINDS; PER CENT. Head.	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.	Total No. observations.	
49° 30′	5° 00′ to											
49 30	10 00	W.	192	0.0	192	0.0	0.0	0.0	100.0	0.0	12	From long. 5° W.
49 30	15 00 *d*	W.	192	30.2	250	12.6	16.8	16.8	53.8	0.0	43	
50 40	10 00											From long. 10° W.
49 30	15 00 *d*	W. by S. ¾ S.	202	36.1	275	16.5	15.5	17.5	50.5	1.9	105	
48 08	20 00	W. S. W.	213	37.1	293	14.0	*w* 30.8	23.8	31.4	2.8	74	
46 45	25 00	W. S. W.	219	24.0	272	9.0	*w* 22.5	7.5	61.0	3.1	67	
45 18	30 00	W. S. W.	226	29.3	292	10.8	18.0	*w* 24.0	47.2	7.0	92	
45 18	35 00	W.	211	22.7	259	6.6	15.5	*w* 20.9	57.0	2.1	91	
45 18	40 00	W.	211	28.8	270	9.0	12.0	*w* 28.5	50.5	9.2	71	
43 49	45 00	W. S. W.	232	18.9	276	5.5	*w* 18.7	16.5	59.3	6.8	78	
43 49	50 00 *d*	W.	215	19.6	256	4.4	*w* 20.9	13.2	61.5	0.0	91	
42 19	55 00	W. S. W.	237	17.0	277	3.6	13.2	*w* 19.2	64.0	8.5	89	
40 46	60 00	W. S. W.	244	22.1	298	5.5	*w* 25.3	15.7	53.5	4.4	94	
40 46	65 00	W.	225	16.3	261	6.4	*w* 14.8	12.8	66.0	3.2	64	
40 46	70 00 *d*	W.	225	26.8	285	9.1	*w* 21.0	16.7	53.2	3.6	143	
40 27	74 00 *d*	W. ½ S.	183	24.4	226	9.0	*w* 23.0	11.0	57.0	2.1	97	
			2843		3540							

Average sailing distance, from 5° W., by this route, 3,707 miles; and from 10° W., coming out of Liverpool, 3,540. The aggregate of adverse winds, expressed in their equivalents of *winds dead ahead*, give 697 miles from Liverpool, and 687 from the Channel, for the average number of miles to be overcome by a dead beat during the voyage. It will be observed that the most difficult parts of the route are between longitudes 15° and 20°, 25° and 30°, and 35° and 40° W.; and that calms are most prevalent between longitudes 25° and 30°, 35° and 45°, and 50° and 55° W.

Europe to New York.—FEBRUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	Slants from N'd.	Slants from S'd.	Fair.	Calms.	
49° 00′	*d* 10° 00′ to										
47 38	15 00	W.S.W.	216	9.9	237	1.9	*w* 20.9	0.0	77.2	1.9	52
47 38	20 00	W.	202	18.8	239	5.6	11.2	*w* 19.6	63.6	1.4	69
47 38	25 00	W.	202	16.6	235	4.0	15.0	*w* 21.0	60.0	4.0	103
47 38	30 00	W.	202	24.8	242	6.3	17.2	*w* 25.4	51.1	4.3	111
46 12	35 00	W.S.W.	225	22.2	275	4.0	*w* 27.0	24.0	45.0	4.9	106
46 12	40 00	W.	208	29.4	269	11.2	12.8	*w* 19.2	56.8	3.1	65
46 12	45 00	W.	208	17.1	244	3.0	16.5	*w* 22.8	57.7	1.5	66
44 44	50 00 *d*	W.S.W.	230	5.5	242	0.0	9.1	*w* 27.3	63.6	9.0	12
44 44	55 00	W.	213	23.9	264	8.8	*w* 22.0	16.5	52.7	2.3	88
43 15	60 00	W.S.W.	234	16.7	275	4.4	*w* 25.3	7.7	62.6	7.8	96
41 44	65 00 *d*	W.S.W.	239	20.9	288	6.0	*w* 31.2	8.4	55.0	0.0	84
40 44	70 00	W. by S. ½ S.	233	24.1	290	8.5	*w* 27.2	11.9	52.4	6.6	62
40 29	74 00	W. ½ S.	184	11.3	204	0.0	*w* 21.1	13.5	65.4	1.9	106
			2796		3304						

Average sailing distance, from 10° W., by this route, 3,304 miles; for 308 of which the winds average ahead. It will be observed that, from longitude 25° to 35°, a vessel is more liable to adverse than fair winds; and further, that in this month the winds prevail very much from the westward, though not so much so as in some of the other months. From port, steer for longitude 10° in latitude 49°.

From Captain W. S. Stafford, Ship Leila, after a winter voyage, 1854–5.

DEAR SIR: I have herewith the pleasure of transmitting you the journal of the "Leila," from Baltimore to Rotterdam, and back to New York. Having given you my observations upon the specific gravity of sea water my last voyage, I deemed it unnecessary* to repeat them this; and, moreover, the heavy wea-

* I regret the loss of these observations very much. Quantity and quality are both in demand; the one cannot be too *good*, nor the other too *great*, with regard to any one of the objects upon which the abstract log calls for observations. I cannot have observations too often repeated along the same route. On the contrary, the oftener the better. Nor can I have the abstract logs for too many voyages. And it should be understood that, when a navigator receives the Charts, and hands over the abstract log of his next voyage, that he is not done; that he is under the same obligations to send me the log for the next, and the next, and until he hears from the Observatory the cry "enough." Captain Stafford is a good observer, and I hope he will, in future, omit nothing that the log calls for.—22d February. M.

ther encountered in a winter voyage to Europe, precludes the possibility of making observations with any degree of satisfaction. You will perceive that I have kept something to the northward of your advised course for January, upon my homeward-bound passage, and, as you will perceive, have made one of the best passages of the season. I kept pretty nearly between the courses for January and February. [He arrived 12th February; 25 days' passage.]

Should you have anything new since your sixth edition, which you were so kind as to forward me last June, I would be glad to receive the same.

Europe to New York.—MARCH.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.	
			True.	Per cent.	Average.	Head	SLANTS FROM N'd.	SLANTS FROM S'd.	Fair.	Calms.		
49° 30′	5° 00′ to											
50 00	6 54	W. N. W.	79	6.6	85	0.0	*w* 16.6	8.3	75.1	0.0	12	From Channel.
50 49	10 00	W. N. W.	128	15.4	147	3.0	14.0	14.0	69.0	2.7	38	
50 00	13 06	W. S. W.	128	25.9	161	10.0	16.4	18.0	55.6	3.5	110	
49 30	15 00	W. S. W.	79	23.0	97	3.0	*w* 38.0	21.0	38.0	0.0	67	
49 30	20 00	W.	195	24.6	244	6.0	*w* 26.0	23.0	46.0	0.0	74	
49 30	25 00 *d*	W.	195	17.5	228	3.3	17.0	*w* 25.3	54.4	2.2	90	
46 05	30 00	W.	290	26.5	366	9.0	*w* 30.8	8.2	52.0	1.1	90	
46 05	35 00	S. W.	208	14.8	238	3.4	15.4	*w* 21.0	60.2	1.7	59	
46 05	40 00	W.	208	25.0	260	9.1	7.0	*w* 25.0	58.9	1.2	82	
46 05	45 00	W.	208	22.6	253	6.0	19.0	20.0	55.0	1.5	67	
46 05	50 00	W.	208	12.6	234	6.0	*w* 6.0	3.0	85.0	0.0	36	
45 00	53 40 *d*	W.	170	10.0	187	0.0	*w* 25.0	0.0	75.0	8.3	13	
44 37	55 00	W. S. W.	61	13.9	148	4.7	*w* 12.3	8.4	74.6	0.9	108	
43 08	60 00	W. S. W.	234	8.9	255	0.9	*w* 16.9	8.9	73.3	5.3	118	
41 36	65 00 *d*	W. S. W.	239	17.3	280	4.2	*w* 18.2	14.1	63.5	4.1	126	
40 02	70 00	W. S. W.	245	17.2	286	4.1	*w* 18.8	12.8	64.3	1.4	200	
39 37	71 00	W. S. W.	65	19.4	77	5.7	15.2	14.4	64.7	2.0	457	
40 27	74 00 *d*	W. by N. ¾ N.	146	20.7	176	5.5	*w* 20.0	15.6	58.9	3.0	304	
			3086		3722							

Average sailing distance, from 5° W., by this route, 3,722 miles. The average per centum of adverse winds is equivalent to winds *dead ahead* for 636 miles. It will be observed that the most difficult part of this route is between longitude 10° and 30° W., where there are few calms, but a great prevalence of westerly winds.

Europe to New York.—APRIL.

Latitude.	Longitude.	Course.	DISTANCES. Direct.	Per cent.	True.	WINDS; PER CENT. Head.	North.	South.	Fair.	Calms.	Total No. observations.	
49° 30′	5° 00′ to											
49 30	10 00	W.	195	9.0	213	5.5	*w* 11.0	5.5	78.0	5.6	19	From
49 30	15 00 *d*	W.	195	12.7	230	1.1	14.7	13.2	71.7	0.0	89	Channel.
50 40	10 00											
49 30	15 00	W. ¾ S.	205	21.0	248	7.5	17.1	18.2	57.2	4.0	85	
46 06	20 00	S. W.	289	9.8	317	9.8	*w* 18.0	13.2	49.0	7.5	86	
45 00	21 34	S. W.	93	11.9	104	2.5	*w* 14.3	11.7	71.5	5.9	125	
44 46	25 00	W. ½ W.	147	15.1	168	0.0	14.0	*w* 33.6	52.4	5.7	37	
45 00	30 00	W. ½ N.	147	16.2	171	6.0	7.5	*w* 13.0	73.5	4.5	70	
44 46	35 00	W. ½ S.	147	16.8	172	6.7	8.6	*w* 10.5	74.2	1.0	104	
44 46	40 00	W.	313	20.2	256	12.4	12.5	*w* 22.9	52.2	2.7	115	
44 46	45 00	W.	213	27.5	271	7.1	23.9	24.0	45.0	2.7	115	
44 46	50 00 *d*	W.	213	18.7	253	5.2	14.7	*w* 17.3	62.8	6 9	115	
43 16	55 00	W. S. W.	234	22.9	268	8.2	*w* 18.1	10.0	63.7	10.1	120	
41 43	60 00	W. S. W.	242	14.3	276	4.1	14.7	*w* 26.2	55.0	4.1	126	
41 43	65 00 *d*	W.	223	22.4	272	6.5	19.5	19.5	54.5	7.5	86	
40 27	70 00	W. ¾ S.	240	19.9	268	7.3	*w* 14.8	12.8	66.4	2.5	161	
40 27	74 00	W.	182	15.4	210	3.6	16.2	*w* 19.8	60.4	7.1	180	
			2973		3437							

Average sailing distance from 5° W., 3,437 miles; average per centum of adverse winds equivalent to winds *dead ahead* for 464 miles. Frequent calms in this month.

Europe to New York.—MAY.

Latitude.	Longitude.	Course.	DISTANCES. Direct.	Per cent.	True.	WINDS; PER CENT. Head.	North.	South.	Fair.	Calms.	Total No. observations.	
Channel	to											
50° 50′	10° 00′	W. N. W.	209	7.8	225	2.8	11.2	2.8	83.2	5.5	38	
50 50	15 00	W.	191	17.6	226	5.5	18.7	11.5	64.3	1.1	96	
50 50	20 00	W.	191	13.2	216	4.4	5.5	15.4	74.7	6.7	95	
50 50	25 00	W.	191	8.2	206	0.0	12.0	9.6	78.4	0.0	42	
50 50	30 00	W.	191	20.5	228	9.6	6.4	12.8	71.2	3.2	32	
49 30	35 00*d*	W. S. W.	209	14.1	237	2.9	5.9	17.7	73.5	0.0	17	
46 08	40 00	S. W.	286	18.2	337	5.0	20.0	9.0	66.0	5.0	104	
44 41	45 00	W. S. W.	228	15.2	261	0.0	24.0	28.0	48.0	3.9	53	
44 41	50 00*d*	W.	213	21.3	258	7.0	9.8	23.2	60.0	4.8	195	
44 41	55 00	W.	213	22.3	260	7.2	13.7	22.2	56.9	3.9	160	
43 11	60 00	W. S. W.	234	18.0	276	3.1	15.8	21.3	59.8	3.0	170	
41 39	65 00	W. S. W.	239	21.7	282	7.2	17.1	11.0	64.7	3.9	189	
40 05	70 00	W. S. W.	245	27.2	310	10.6	17.1	13.0	59.3	7.3	281	
Port		W. ½ N.	184	10.0	202	2.5	10.8	14.5	72.2	4.0	235	
			3024		3524							From Channel.
			2815		3299							From Liverpool.

Aim to make a straight course from *d* to *d*.

Captain Oliver Eldridge, of the Liverpool packet ship, the Garrick—to whom I am indebted for much valuable information, and who is, moreover, a most zealous and efficient co-operator in collecting materials for these Charts—reports, on his last voyage from Liverpool, two deep-sea soundings. They were without bottom; but they are the first I have received from a merchant ship, and I quote them as well for their value as for the example which they afford to the industrious and intelligent navigator, as to what he may do in assisting men of science to solve this interesting problem—the depths of the sea. A line of deep-sea soundings hence to Europe would be of great value and interest. It is supposed that the depth of the sea in that quarter is not very great, and that, therefore, these soundings may be had without much trouble to those who may be disposed to undertake them.

The following is from the abstract log of the Garrick, on her voyage from Liverpool to New York, May and June, 1852:—

"30th May. Lat. 48° 5′ N.; long. 41° 39′ W. Temperature, 55°. Let 1,150 fathoms line run out without finding bottom.

"2d June. Lat. 45° 14′ N.; long. 46° 36′ W. Temperature, 48°. No soundings with 450 fathoms line, and a strong current setting S. E. by E."

His distance per log was 3,385 miles, being only 86 miles more than, according to the above route for May, he should have logged. This is but one of the many instances that I continually receive, illustrative of the correctness of the routes recommended. Steer such courses, the tables say, and you will meet on the average such and such winds; and the distance which you will have to sail, in order to accomplish your voyage, will be so many thousand miles. The navigator does it, and, in some instances, the computed distance and the actual distance by the log, will be found, after a voyage of 4,000 or 5,000 miles, to differ only a few leagues. In this case of the Garrick, the difference, though comparatively large, is less than 30 marine leagues.

Europe to New York.—JUNE.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			Direct.	Per cent.	True.	Head.	North.	South.	Fair.	Calms.	
Channel	to										
48° 18′	10° 00′	W. S. W.	213	29.4	276	9.1	16.9	35.1		0.0	78
44 52	15 00	S. W.	292	12.1	327	1.7	21.0	9.3		8.4	129
41 13	20 00	S. W.	310	2.4	316	0.0	3.0	6.0		0.0	33
39 39	25 00	W. S. W.	247	14.2	281	4.0	18.0	11.4		0.0	51
39 39	30 00	W.	230	23.2	283	7.1	14.3	22.0	57.0	4.4	189
39 39	35 00	W.	230	12.5	259	0.0	12.0	20.0	68.0	5.6	200
39 39	40 00	W.	230	26.0	290	11.0	15.8	17.3	55.9	3.4	215
39 39	45 00	W.	230	18.2	272	5.0	8.0	24.5	62.5	3.4	213
39 39	50 00	W.	230	13.2	263	2.8	6.0	22.8	78.4	2.5	251
39 39	55 00	W.	230	22.3	281	7.2	10.0	22.3	65.5	4.1	281
41 13	60 00	W. S. W.	247	20.4	297	7.6	3.1	22.0	67.3	0.9	225
41 13	65 00	W.	226	25.3	283	8.0	7.0	36.0	49.0	3.8	210
40 28	70 00	W. by S.	231	30.0	300	14.0	7.5	19.4	59.1	3.5	235
Port		W.	184	19.3	220	6.2	11.5	23.3	59.0	2.7	232
			3330		3948						

A tedious time of the year is the month of June to the homeward-bound.

Europe to New York.—JULY.

Latitude.	Longitude.	Course.	DISTANCES. Direct.	Per cent.	True.	WINDS; PER CENT. Head.	North.	South.	Fair.	Calms.	Total No. observations.	
49° 40′	5° 00′to											
48 18	10 00	W.S.W.	213	15.6	245	4.2	25.0	0.0	70.8	0.0	24	
48 18	15 00	W.	200	23.0	246	5.5	27.5	14.3	52.7	2.2	94	
44 50	20 00	S.W.	295	14.2	336	1.6	27.8	8.2	62.4	2.5	125	
44 50	25 00	W.	212	37.8	292	15.0	15.0	30.0	40.0	2.8	36	
44 50	30 00	W.	212	18.5	251	5.0	14.9	16.2	63.9	16.2	93	
44 50	35 00	W.	212	11.0	235	3.0	4.0	14.0	79.0	7.4	104	
44 50	40 00	W.	212	24.9	264	10.5	5.6	18.2	65.7	6.3	151	
44 50	45 00	W.	212	14.8	244	5.4	8.1	8.7	77.8	4.7	155	
44 50	50 00	W.	212	24.2	263	8.7	10.0	20.0	61.3	8.1	173	
43 20	55 00	W.S.W.	233	20.0	279	5.5	17.8	17.1	59.6	5.4	236	
41 48	60 00	W.S.W.	240	26.9	305	8.3	21.2	19.2	51.2	5.6	263	
40 14	65 00	W.S.W.	245	35.0	330	13.6	19.8	21.3	45.3	8.4	350	
40 14	70 00	W.	230	27.8	294	10.7	10.8	26.0	52.5	8.7	314	
Port	74 00	W.	183	29.9	237	11.2	7.7	35.9	45.2	4.2	322	
			3111		3821							From Channel.
			2950		3623							From Liverpool.

Europe to New York.—AUGUST.

Latitude.	Longitude.	Course.	DISTANCES. True.	Per cent.	Average.	WINDS; PER CENT. Head.	SLANTS FROM N'd or E'd.	S'd or W'd.	Fair.	Calms.	Total No. observations.
49° 40′	5° 00′to										
48 20	10 00	W.S.W.	210	19.0	250	5.6	11.2	16.8	66.4	0.0	36
44 55	15 00	S.W.	291	22.4	255	7.2	26.4	5.6	60.8	3.2	130
43 25	20 00	W.S.W.	234	14.9	269	6.2	12.4	0.0	81.4	6.2	17
41 54	25 00	W.S.W.	238	15.6	275	1.7	28.9	11.9	58.5	0.0	60
41 54	30 00	W.	223	16.8	260	5.8	11.6	11.6	71.0	2.9	35
41 54	35 00	W.	223	21.4	270	6.0	15.0	22.0	57.0	1.9	106
41 54	40 00	W.	223	18.6	264	4.8	12.0	20.8	62.4	4.7	133
41 54	45 00	W.	223	18.1	263	5.6	9.8	19.6	65.0	5.0	147
41 54	50 00	W.	223	16.3	259	7.8	4.2	7.2	80.8	3.7	166
40 20	55 00	W.S.W.	244	17.9	268	3.5	19.5	17.0	60.0	6.5	213
38 44	60 00	W.S.W.	250	22.7	306	6.6	12.6	20.4	64.4	7.9	164
40 20	65 00	W.N.W.	250	10.8	277	2.0	7.0	17.5	73.5	4.3	193
40 20	70 00	W.	229	19.0	272	7.5	9.6	16.2	66.7	6.3	336
40 20	74 00	W.	183	16.3	208	7.0	8.0	12.5	72.5	6.0	194
			3244		3696						

Europe to New York.—SEPTEMBER.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	North.	South.	Fair.	Calms.	
49° 30′	5° 00′ to										
46 09	10 00	S. W.	284	3.0	292	0.0	10.0	0.0	90.0	0.0	20
45 00	11 38	S. W.	98	13.3	111	1.8	19.8	12.6	65.8	1.8	57
44 00	15 00	W. S. W.	155	3.6	160	0.0	0.0	18.0	82.0	0.0	17
44 00	20 00	W.	216	7.7	231	0.0	2z.0	5.5	72.5	0.0	18
40 18	25 00 *d*	S. W.	314	6.2	333	0.0	7.7	7.7	84.6	7.7	14
40 18	30 00	W.	229	19.6	274	6.8	18.7	10.2	64.3	7.0	62
40 18	33 00	W.	143	6.8	152	1.3	8.8	7.5	83.4	8.7	87
39 42	35 00 *d*	W. S. W.	94	14.0	107	6.2	2.6	11.3	79.9		
39 42	40 00	W.	230	15.2	265	4.4	13.2	13.2	69.2	0.0	95
39 42	45 00	W.	330	14.2	263	3.2	8.0	20.8	68.0	7.7	139
39 42	50 00	W.	230	16.7	269	6.3	3.5	16.8	73.4	5.1	145
39 42	55 00	W.	230	13.9	262	5.6	6.3	10.5	77.6	3.6	144
40 39	58 00	W. N. W.	149	16.1	173	4.4	10.8	16.0	68.8	4.0	148
38 45	65 00 *d*	W. S. W.	349	14.0	398	3.5	10.5	16.1	69.9	3.4	154
40 20	70 00	W. N. W.	250	19.1	298	6.5	9.5	16.5	67.5	5.4	194
Port		W.	183	16.4	212	6.3	5.4	20.7	67.6	4.5	115
			3384		3800						

The routes to and fro, between Europe and the United States, do not require any written explanation. If the navigator will project them, and then consult these pages and the Pilot Chart, he will never be at a loss, as to his best course *on the average*. In projecting these tracks on his Chart, he will find them running sometimes inconveniently near the land or over shoals. Of course, he will not infer that he is recommended actually to stand over such places. The route of the tables being intended merely as a guide, from which the land, as well as the winds and currents, will sometimes turn him aside. Navigators who pursue these routes, will confer a favor by making a note of the fact in their abstracts, accompanied with an expression of their opinion as to the advantages of them; mentioning, also, whether they have had any longer or shorter passages than vessels sailing about the same time without the Wind and Current Charts on board.

I have already the pleasure to acknowledge my obligations to Captain Oliver Eldridge, of the Roscius, for such an act of kindness. Under date of May 21, 1850, he writes: "In reply to your inquiries as to my opinion in regard to the New Sailing Directions and Routes recommended by yourself, I would say, that as far as I have had opportunity of judging, I think they will be of great advantage, and in particular to that part of the commercial community who depend upon wind as a propelling power.

"On my last passage to Liverpool, I think it was lengthened some *two* or *three days* by not following more closely the directions recommended by you, in your No. for January, 1850; as a ship that left New York with us, kept in company, or nearly so, to the longitude of 25°. The wind then came out ahead; we stood on the southern tack, and she on the northern (as recommended by you). The wind afterwards came N. N. E.; she brought up to Cape Clear, and we 200 miles south of it."

Capt. Samuel Clark, of the James Wright, in a letter of May 9, 1853, says: "As an instance of their use [the Pilot Charts], after examining them in Liverpool, previous to the last passage to New Orleans, I made up my mind to take the northern route, *via* the Hole in the Wall, and the southern edge of the Banks of Newfoundland; and on stating my intention to several shipmasters of my acquaintance, they unanimously told me that I should miss it, and that they should take the trades for it. And although the most of them sailed from five to fifteen days before me, I arrived at New Orleans four or five days before the first of them, and, in several cases, ten to fifteen days. On the 3d of October, I dined in company with a New Orleans merchant, who was interested with my friends, in the shipment of cotton; and he asked me about what time he might expect me in New Orleans. I told him that I expected to be there on the 10th November, and by the abstract that I presented you, you will see that on that day I was at the mouth of the Mississippi. It was my intention to have gone to the northward and westward of Bermuda, but was prevented by light westerly winds, when I had expected easterly winds; still, you will see that the daily distances sum up under 5,000 miles, which is near 1,000 less than the common route, *via* the trade-winds and the south side of Cuba. You will see by the inclosed abstract, that I made the return passage to Liverpool in a little over 4,600 miles, which I think is about as short as a *cotton* loaded ship can well make it, as they have to make a free wind, of what a stiff heavy loaded ship would go by the wind. I have no abstract of my passage from Liverpool, as the weather on this passage has been so variable that I could not keep one to my satisfaction for want of observations."

So, also, Capt. Myrick, of the Diadem, June, 1853:—

"I am firmly convinced of the utility of the Pilot Charts of Mr. Maury, in shortening passages across the Atlantic; and, had I not had one, should have probably prolonged the passage several days. In consulting the Chart for the prevailing winds for the month, I found that, from the Azores, the wind prevailed from the N. E. quarter to the longitude of 10° west, and then from W. N. W. to W. S. W. After leaving the Islands, we had to brace sharp up, and had strong breezes, bringing us to two-reefed topsails; so that, in 12° west, we were to leeward of the Straits of Gibraltar; and, had I not had a chart on board relating to the winds, should have tacked to avoid falling upon the African coast. But, having firm conviction that a different wind would be found in 10° west, I kept on the port tack and eventually found my anticipations correct, the wind hauling to the westward and carrying us through the straits with a fair wind. I think every master should provide himself with the Charts, as he thereby has the experience of many in a condensed form; and has an opportunity of placing his vessel on the weather side and avoid falling to leeward."

Perhaps some navigators may have an opportunity to throw further light as to the green patch or shoal to which the following extract from the log of the ship Diadem, Frederick Myrick, relates. She was bound from Mobile to Toulon, 1853.

"May 6. Lat. 37° 58′ N.; long. 69° 10′ W. Current, two knots per hour. Barometer, 29.70. Temperature, air, 66°; water, 72°. Winds: first part, S. S. W.; middle part, S. W.; latter, W. Strong gales

with rain. A heavy bank of clouds to the north, passing eastward. Saw blackfish. I expect to be on a bank to-morrow, as I have always found green water and low temperature in longitude 65° W.

"May 7. Lat. 37° 45′ N.; long. 65° 30′ W. Current the same. Barometer, 29.60. Temperature, air, 60°; water, 59°. Winds: first and middle parts, W. N. W.; latter, north. Fresh gales, with passing mist, showers, and lightning. Green water, kelp-weed, chips, feathers, blackfish, porpoises. Evidently a bank exists here, there being every indication of soundings. I think the shoalest part, from the appearance of the water on former voyages, is in lat. 38° 50′, long. 65° W.; have always found the same indications in this longitude on repeated voyages."

And again, in the same ship on her return to New York, Captain Myrick, in his abstract log, says:—

"Oct. 13, 1853. Lat. 39° 45′ N.; long. 65° 00′ W. Barometer, 30.00. Air, 58°; water, 58°. Winds: first part, W. N. W.; middle and latter parts, calm. Begins with fresh gales, inclining to moderate. 6 P. M. till meridian, light, variable airs, and calm, cloudy weather. Green water full of bright eyes and sun squalls; some sprigs of gulf and rock-weed. Ends light airs from S. E., and pleasant weather. It is my opinion that we are on the north edge of a bank which I have found in this longitude; water colder farther south on former voyages.

"N. B. I am firmly of the opinion that there is a bank between the latitude of 39° 30′, and 37° 00′, and longitude 65° W., as I have always found the water much colder than the surrounding water. There appear to be very irregular currents between 60° and 55° longitude; some to the westward and others to E. S. E. I think there must be some very irregular formations of the bottom in this vicinity, as the sea is always much agitated, streaks of very green water and blue."

EXPLANATION OF THE ROUTE TABLES.

Columns 1, 2, and 3 (see Tables of Routes, pp. 293 to 304; also those of the route to Rio) explain themselves.

Column 4 gives the distance by middle latitude sailing, to be run on the course in column 3, when the winds are fair.

Column 5 shows the percentage by which the distance in column 4 is to be practically increased on the average, by adverse winds. The numbers in this column are obtained upon this principle: That, if a ship sail with the wind dead ahead, and within six points of it, she loses 62 miles in every hundred—that is, she has to sail 100 to make 38 miles good; when she sails within 4 points of her course, that is, when she has a *slant* wind, that will allow her to lay within 4 points of her course, she loses 29 miles only in 100; and when she sails within two points of her course, that is, when she has a *slant* wind 4 points from the course she wishes to steer, she then loses only 7.6 miles in 100. In other words, a vessel sailing 5 knots an hour, will get as far on her course in 5½ hours with a *slant* wind 4 points from her course, as she will, at

the same rate, in 13 hours with the wind *dead* ahead. According to the ratio here indicated, the 2 and 4 point *slant* winds, have been reduced to their equivalent as winds *dead* ahead, and this equivalent in distance is given in column 5.

Column 6 shows the distance in column 4, after the per cent. in column 5 has been added to it. It is the average distance to be sailed from point to point, not allowing for currents, and supposing the vessel to sail within 6 points of the wind when close hauled.

Column 7 shows the average percentage of winds that are *dead* ahead.

Column 8 shows the average percentage of *slant* winds from the northward or eastward that will head a vessel off the course given in column 3.

Column 9 shows the average percentage of *slants* from the southward or westward that will head a vessel off the course given in column 3.

Column 10 shows the average percentage of winds that are entirely fair for the course given in column 3.

Column 11 shows the average percentage of calms for each district of 5° square through which the course in column 3 leads.

Column 12 shows the number of observations from which the figures in the other columns, and the courses recommended, have been obtained.

When the winds are fair, and the vessel is near the route recommended, she should steer straight from *d* to *d*, instead of making a zigzag track, as by the projection.

The letter *w*, where it appears in column 8 or 9, means that that side is the windward side. But it is not necessary so to designate the windward side. It is obvious from mere inspection.

The letter *e*, in the column of calms, means that this part of the route is through the region of calms that border the northeast trade-winds, north and south, or that that part of the ocean is peculiarly liable to calms. (See *Trade-wind Chart.*)

The courses given are *true*.

It will be perceived by the tables that the average European passage in February, ought to be nearly two days shorter than it is either in January or March.

According to the Pilot Charts, I make the average distance to be sailed by a New York packet ship by the routes, from January to April, not estimating for the set of currents, to be, when bound—

To Liverpool.

In January	3075 miles	to 10° W.,	for	250	of which	a vessel	will have	winds dead ahead.
February	3015	"	" "	234	"	"	"	"
March	3150	"	" "	231	"	"	"	"
April	3051	"	" "	244	"	"	"	"

To English Channel.

In January	3300	miles to 5° W., for	293	of which a vessel will have winds dead ahead.				
February	3245	" " "	261	"	"	"	"	
March	3448	" " "	249	"	"	"	"	
April	3275	" " "	265	"	"	"	"	

According to the log-books taken at random, both of packet ships and transient traders, I find the average time between these meridians and New York to be as per statement subjoined:—

When bound to Liverpool, average length of passage from New York to 10° W.			When bound from Liverpool, average length of passage from 10° W. to New York.			When bound to English Channel, average length of passage from New York to 5° W.			When bound from English Channel, average length of passage from 5° W. to New York.		
Month.	Days' passage.	Number of passages.	Month.	Days' passage.	Number of passages.	Month.	Days' passage.	Number of passages.	Month.	Days' passage.	Number of passages.
January	18	25	January	33	16	January	20	11	January	40	7
February	20	18	February	35	36	February	23	6	February	41	13
March	20	20	March	31	41	March	25	10	March	33	10
April	21	9	April	29	17	April	22	6	April	30	2

It is important that navigators should bear in mind that, when the winds are fair, they are not expected to make the zigzag track of the Tables, but to steer straight from *d* to *d*.

STEAM LANES ACROSS THE ATLANTIC.

The dreadful calamity which befell the U. S. mail steamer Arctic, on her passage from Liverpool to New York, in the month of October, 1854, in consequence of her coming in collision with the French steamer Vesta, in a thick fog, forty or fifty miles to the eastward of Cape Race, first appalled the public mind with its enormity, and then aroused it. Men inquired of each other if science or ingenuity could not devise means, or invent plans for preventing the recurrence of similar accidents; or, in case of their recurrence, of providing against the terrible loss of life which attended the foundering of that noble ship. Of passengers and crew—men, women, and children—there perished, on that occasion, with her, to the number of about 300, owing, in a great measure, to improper management, and to the dastardly conduct of a part of the officers and crew.

Among the many benevolent persons who favored the public with the results of their thoughts upon the subject, some suggested measures remedial, and some preventive. Life-boats and life-preservers, water-tight compartments, station-bills for passengers and crew to "save ship," were among the remedial plans; and among those for prevention were, fog-signals, true compasses, rate of sailing, lookout, and lanes, or a double track for the steamers crossing this part of the Atlantic, viz., a lane for them to go in and another for them to come in.

All, or any of these plans would, if adopted, tend more or less to diminish or mitigate the dangers of steam navigation, and the risk of life that passengers incur at sea; but those plans which tend to *prevent* accident, rather than those that look to affording relief after the occurrence of accident, seemed to come within the scope and objects of this work; and among these the lanes were most inviting. It will be found that, by establishing a lane, or strip of ocean for the steamers to go in, and another for them to come in, the liability to danger from collision between steamer and steamer, steamers and sailing vessels, will not only be lessened, but a new resource upon the high seas will, in many cases of wreck and disaster, be afforded to those in distress.

By examining Plate XXI. carefully, any one may satisfy himself as to the extent to which the adoption of these lanes, will lessen the liabilities—which now are very great—to collision in fog, between steamers and sailers. The curves on that plate show that fogs and calms are, along these lanes at least, almost correlative terms; that is, they often occur together, and in proportion as they do occur together, just in that proportion accidents from collision between *sailing* vessels are lessened; for vessels moved by canvas cannot well run foul of each other in a calm, and in calms with thick fogs, is precisely the time when such vessels are in the greatest danger of being run into by a steamer; for, being helpless then, they cannot get out of the way; consequently, if they will agree to avoid, as much as possible, the steam lanes as they are marked on the chart, by making it a rule never to attempt to beat along in them, but to cross them quickly, when they have to cross them, and to edge along out of them when, being in them, the wind changes and comes out fair. If those public spirited shipmasters who are co-operating with me will, in this way, lend a hand, by giving the force of their example and precept, to dedicate to the use of the steam navigation between Europe and America, the very narrow slip of ocean included within these lanes, they will do much, in addition to what they have already done, toward improving navigation, and lessening the dangers of the sea. On the other hand, the captain of every steamer should as scrupulously aim to keep within the lanes, and never to suffer his vessel to get out of them except she be compelled to turn aside on account of ice, or gales of wind, or unless she get out of them for want of observations after a succession of cloudy days.

I earnestly appeal to that great corps of observers which numbers more than 1000 seamen who act together in concert upon the sea, to whom I owe so much, and to whose enlightened zeal and generous labors for the advancement of science and the improvement of navigation this work bears witness, to second this recommendation, and make it a rule to observe the lanes. This appeal is made especially to those who are in the European trade. They will render a service to be most gratefully acknowledged, if they will always, whenever they enter the lanes, either make haste across them, or run obliquely out of them, according as their course may lie, or as the winds may allow; and when they do find it necessary to enter one of these lanes, they will please note the fact in their abstract log, kept for this office; and state also the time and distance sailed in each lane, with such remarks as circumstances may suggest.

The more sailing vessels will agree to keep out of the lanes, the more will it concern the steamers to keep in them, and the greater becomes the danger at night, or in a fog, to the hapless sailing vessel that shall needlessly thrust herself into one of them. Practically, their adoption will be attended on one hand with so little inconvenience or loss of time, either to sailers or steamers; while, on the other, it will be attended

with so many advantages, and so much less risk to vessels, crews, and passengers, that I do not think it necessary to add another word to induce all, I hope, who follow the sea, but *certainly*, and at *least* those who are co-operating with me, to favor the lanes, and do all that is proper to establish them.

I therefore content myself with laying before them, for their information, the following correspondence, and to say, that the recommendation therein contained, has met with favor from the right quarter, both in Boston, and New York, and with every sea captain with whom I have had an opportunity of consulting.

From Messrs. John S. Sleeper, C. W. Cartwright, J. Ingersoll Bowditch, R. B. Forbes and others, underwriters, ship-owners, and merchants of Boston.

January 8, 1855.

"Lieut. M. F. MAURY, *National Observatory, Washington.*

SIR: In connection with the discussion respecting the dangers of crossing the Atlantic, and the modes of diminishing them, we have observed a suggestion contained in your letter to Walter R. Jones, Esq., of New York, proposing one route for steamers to go, and another for them to come, of which idea you cite our fellow-citizen, R. B. Forbes, Esq., as the original author.

Permit us to hope that this project may receive your farther attention, and that you will prepare a chart, exhibiting the routes suggested, so laid off as may, in your judgment, best answer the purpose in view, of lessening the liability of collision, without materially lengthening the passage.

By thus carrying out a proposition which strongly recommends itself to many, you will add another important service to the many for which we would express our thanks."

Reply to the above, dated Feb. 15, 1855.

"GENTLEMEN: I duly received your communication of the 8th ult. requesting me to carry out the proposition contained in my letter of the 8th of November last, to Walter R. Jones, Esq., of New York, by projecting the two steam lanes across the Atlantic, viz: one for the steamers to go in, and the other for them to come in.

I at once addressed myself to the task, and after a careful examination of the somewhat ample materials afforded by this office, I have at length the pleasure to submit charts with the lanes projected on them, together with other matter bearing upon the subject.

I have examined a number of the logs both of the Collins and the Cunard lines. The part of the ocean used by them in their voyage to and fro, between the meridians of 15° and 65° west, is, for the American, 300 miles broad, and for the English 150 miles broad. The American road-way overlaps and includes the English. Consequently there is a breadth of ocean 300 miles wide, in any part of which, a sailing vessel by night or in the fog, is now liable to be brought into collision with the steamers.

Now suppose we take this same breadth of ocean and lay off a lane twenty or twenty-five miles broad near its northern border, and another, fifteen or twenty miles broad near its southern border, and recommend the steamers, when coming westwardly, to use the former, and when going eastwardly, to take the

latter; would not the adoption of the recommendation contribute to the safety both of steam and sailing vessels, of passengers and crews? I think so.

I do not mean to create the impression, by anything I say or do, that the adoption of these lanes would *do away* with collisions, or call for less vigilance, or relieve in any manner the shipmaster from his obligations to look closely to the navigation of his vessel, to be watchful, prudent, cautious, and careful. On the contrary, he must never relax his attention to the seaman's three L's, nor slight his water thermometer. The adoption of the lanes will simply lessen the *liabilities*, by diminishing the *chances* of collision, and to that extent make the navigation of the Atlantic *less* dangerous. So far from relaxing attention to the log, lead, and look-out, these lanes call for increased diligence on the part of the master, for that breadth only is given to them which will just make them broad enough to cover the probable errors in latitude of a good, careful navigator, after he has been two or three days without an observation. A narrower lane would be forbidding, from the difficulties of keeping in it; a broader lane would be mischievous by relaxing its calls upon the attention of the master to keep his steamer in it, and by occupying so much of the ocean that sailing vessels would not so willingly, because they could not so conveniently, give it up to the steamers.

If these lanes be adopted by the steamship companies, and engraved on the general charts of the Atlantic that are used by the vessels of the different nations, and marked as they are on the chart of the Atlantic, by Blunt, herewith sent, or as I have instructed the engraver to project them on the Track Charts, series A, of the North Atlantic, and as they are on Plates XI. and XII., I have very little doubt that sailing vessels would, in the process of time, make it a rule to edge off from the lanes, especially at night and in thick weather. In the first place, the lanes are so narrow that if the sailing vessel have to cross them, as in head winds, and in the progress of her voyage she not unfrequently will, she will be but a little while in them, and her master will then know on which side to watch for the danger. In the next place, if his course lie along the lane, and the winds be fair, he will, as night comes on, or as the weather grows thick, begin to think of the steamers and collision, and his own responsibilities, and then feel much more comfortable by edging off to one side and leaving the steam-track clear.

The average route of the steamers coming, as determined by the abstract logs on file here, crosses the meridians of 40°, 45°, and 50°, from forty-five to sixty miles north of the lane to America, and joins it on the meridian of 55°, and then runs nearly along with it to Sandy Hook.

The lane coming is, therefore, a better road than the average route at present used, and for these reasons, viz: It is thirty miles shorter; it runs so far south of Cape Race and the Virgin Rocks, that no time need ever be lost in turning aside, when fogs prevail, to avoid these dangers, for it passes one hundred miles south of Cape Race.

This statement, without any explanation, might appear paradoxical, for the nearer to Cape Race, the shorter the distance; yet, practically, it has not proved so, because vessels, especially in the fog, as they near this cape, have frequently to run one, two, three, or more hours to the southward to be sure of clearing it. When they are so running, they are not making much headway towards their port. So, on the long run, the attempt to shave Cape Race makes the average distance practically greater than it is by

the lane. Indeed, it is greater than the statement above implies, for the distance which I have taken as the average by present routes is measured by straight lines from position to position, at noon.

Congress has given the Secretary of the Navy authority to employ three vessels in assisting me in my researches, by testing new routes, and perfecting discoveries. They can be very usefully employed just at this time. Perhaps he may find it convenient in the spring to detail one or two of them for this service. If so, I shall urge upon his attention the importance of completing the deep-sea soundings across this part of the Atlantic, and also ask for an examination of the Virgin Rocks, with the view of planting on them, or just under their lee, a bell buoy. In that case, this lane might be lifted up so as to shorten the distance and save time by bringing this buoy on the edge of it, and thus provide a landmark that would be very useful in all weather and to all classes of vessels.

The shortest distance possible for a steamer between Liverpool and Sandy Hook is 3,009 miles; the average distance actually accomplished is 3,069 miles, and the distance by the middle of the lane coming is 3,038. There is also another recommendation in favor of this lane to the west, which is this: It lies along the northern edge of the Gulf Stream, where there is an eddy setting to the westward often at the rate of a knot an hour. On the average, I assume that the set of this eddy will amount to twelve miles a day for three days and a half, or, say forty miles. This makes the distance by the lane coming practically about 2,998 miles; or, allowing twenty miles for detour, we shall have 3,018 miles, which will shorten the average time of the passage this way three or four hours, with less risk of collision, and less danger from Cape Race by the way.

It may be urged against this lane that it cannot always be followed on account of the ice, and that inasmuch as it crosses the Grand Banks, the steamers that ply in it may now and then run down a fishing vessel. The reply is, that as far as the fishermen are concerned, they are now liable to be run down by the steamers both going and coming. Whereas, with the lane, that liability is incident to the steamers alone that are westwardly bound, and the fishermen will have the advantage of knowing pretty nearly where the steamer will pass, and which way she will be coming. And as for its being obstructed by ice, so as to compel the steamers, as it occasionally will, especially in May and June, to turn out of it now and then, the Erie Canal, of New York, is obstructed by ice the whole of every winter, but that does not prove it to be of no value; it only shows that it, like this lane, would be of more value to commerce if it were never obstructed by ice, or anything at all.

You will observe by looking at this lane upon the Blunt's Chart, that the Grand Banks afford a pretty good landmark which can be used in the thickest weather. Generally the water thermometer is found to fall as soon as you near these Banks: it is generally a good landmark for them. The eastern edge runs north and south, and, therefore, affords an excellent correction for longitude. Having ascertained, by the lead, when the vessel first strikes this edge, then noting the soundings and the distance run before clearing the Grand Banks, the latitude will also be known with accuracy sufficient to enable the navigator to decide whether he be in or out of the lane, and if out, on which side. The lane crosses the Banks near their greatest width, 275 miles. If a steamer be crossing there in a fog, and in doubt as to her position, she can judge,

by their breadth and the soundings, pretty nearly as to latitude. For instance, if the breadth of the Banks when crossed be less than 275 miles, but the soundings not less than forty fathoms, the vessel has crossed the Bank to the north of the lane; but if she find herself in less than thirty fathoms, then she has crossed to the south of it. Should she, however, find herself in water that suddenly shoals to less than twenty fathoms, and as suddenly deepens again, then she is near the Virgin Rocks, or the rock and Nine-fathom Bank to the east of them, and her position is immediately known.

It should be recollected, however, that these lanes are not channel-ways in which steamers must keep or be lost. Gales of wind, ice, and other things, will now and then force a steamer out of them, and in such cases she will actually be where she is now, for she will then be in no more danger than she is now; only when she gets back into the lane she will be in less.

You will doubtless observe the advantageous position of the fork to Halifax, in the lane from Europe. As this lane approaches Newfoundland, it edges off to the south, in such a manner as to render it impossible for a vessel so to miss her way as to get ashore. Suppose a steamer attempting this lane to be, when she nears the Grand Banks, 100 miles out in position (a most extravagant case), and that she be out on the Newfoundland side, she would, if behaving properly, be steering parallel with the lane, and if bound to New York, she would go clear of Cape Race. But she might be bound for Halifax, and by steering west too soon, might run upon the land; but recollect that the lane to Halifax turns off *on soundings*, and a west course from where the lane from England strikes soundings on the Grand Banks will take you clear of everything. So without the most gross neglect of the lead and all the proper precautions, which it is the duty of the shipmaster to take, it would seem impossible for him to run his steamer into danger here.

In the longitude of the Grand Banks, the lane to Europe is 200 miles south of the lane to America. As a rule, this lane for the eastern bound steamers can be followed always, admitting that an exception now and then in practice will make the rule general. It will be observed, that this lane runs E. 15° S. from Sandy Hook to the meridian of 70°, where it takes a course E. 12° N., towards its junction with the arc of a great circle, south of the Grand Banks. Though the distance by this lane, from Sandy Hook to this junction, is a few miles longer than the direct line, yet on account of the Gulf Stream it is in *time* the shortest distance that a steamer can take. From the Capes of Delaware it is obviously the shortest.

The distance from Sandy Hook to Liverpool, by this lane, is 106 miles greater than it is by the lane coming. But the lane going is in the Gulf Stream, which of itself will nearly, if not quite, make up for this difference. The San Francisco steamer was wrecked in the Gulf Stream, and from the time she was disabled till she was abandoned, she drifted at the rate of two knots an hour. When the Great Western steamship first came over, she stemmed the Gulf Stream, and was set back in it 175 miles during the voyage. Now, from the Grand Banks west, the track of the Great Western was not as much in the strength of the stream as this lane is, for she passed to the north of it. This trip, too, was in April, when the middle of the stream is well south.*

* The thread or axis of the Gulf Stream moves up and down in declination as the sun does, being farthest north in September, farthest south in March. Its limits are not accurately described on any general chart that I have seen.

I may be excused for mentioning, in this connection, an incident relating to the early history of ocean steam navigation. After this passage of the Great Western, I wrote a paper on the achievements of the New York packet ships, and pointed out on a chart the great circle route from New York to England, and commended it to the attention of those concerned in this new navigation. The paper, with the chart, was published in the *Southern Literary Messenger* (Richmond, Va.), for January, 1839. The editor sent a copy to Captain Hoskins, and he ever afterward went by the route recommended on that chart. His competitors stuck to the old rhumb-line route, and from that time, Hoskins generally beat them, this way, about a day: and here is the explanation. They were set back, in the Gulf Stream, 150 or more miles; he was set forward forty or more, by the eddy, and gained some 50 or 60 additional, by the great circle, which made altogether about one good day's sail in his favor. The great circle, or Cape Race route, was not generally adopted, however, even when he left the line; and it has been mischievous by tempting navigators to shave the cape too closely.

The current of the Gulf Stream is not only in favor of the lane going, but the gales are more favorable, and the fogs less frequent than they would be by a more northerly route.

In order to enable you to judge knowingly as to the relative merits of these two lanes in this respect, I have, with the help of the most willing, zealous, and able corps of assistants that one ever had, and such as can be formed only of navy officers, examined and discussed abstract logs containing observations for no less than 46,000 days, on the winds, weather, the sea, and the currents, in the parts of the ocean through which these lanes pass. The result of that discussion I submit herewith for information, on a chart of engraved squares (Plate XXI.). The horizontal lines are there marked as per cents., each being counted as one, and every fifth one being a little more heavily ruled than the rest. The vertical lines, marked 70°, 65° 60°, &c., are meridians of longitude between which the lanes pass. Between each two of these meridians are twelve columns for the twelve months, beginning always with December, the first winter month. Thus, the navigator wishes to see what is the most foggy month in the lane to America between the meridians of 70° and 75°. He finds on the plate the fog curve for that lane, and his eye is immediately attracted to the remarkable peak formed by this curve, in the July column between these meridians; the meaning of which is, that, according to the averages derived from these 46,000 days, the probabilities are, that if he were to pass along this part of that lane one hundred times, in the month of July, but in different years, he would find it foggy twenty-eight times; or, in other words, twenty-eight per cent. of the days in July are foggy along that part of the lane. Casting his eye farther along, he will see that fogs, at certain seasons of the year, are astonishingly prevalent from long. 55° to long. 45° (on the Grand Banks), and when he comes to count the columns, he will find that June is the foggiest of months. But the relief and the consolation is, that that is precisely at the season of the year when daylight is the longest, so that even here there is compensation.

Now he looks at the fogs for the lane going, and he is struck with the more modest flexures of the curve, and particularly with the fact that both the fog curves almost invariably come down to the zero (0) line

near the meridians. In other words, that the fogs are less prevalent in both lanes, during the autumn and winter, when there is least daylight.

In like manner, he wishes to know as to his chances for meeting with a gale of wind, as he passes along in the lane to Europe, and whether these gales will be adverse or fair; in other words, whether they will have easting or westing in them. Now, he sees, under the head of "Lane to Europe" (Plate XXI.), by the curve marked "fair gales," that the most stormy part along this line is between the meridians of 35° and 40°; that here, in January, it is blowing a gale of wind half the time (fifty-two per cent.), while at certain other seasons of the year gales seldom or never occur. But these gales all have westing in them, and are, therefore, fair. The preponderance of fair gales along the lane to Europe, viz: all gales having westing in them, is very striking. The vessel will be running with these gales, and therefore diminish their strength. In like manner the gentle flexures in the curve marked "head gales," denote how much less frequently gales with easting in them are to be met with in the regions through which this lane passes. Now he will be struck with another remarkable physical fact which experience has proved and these statistics have developed: that fogs and gales, in certain parts of the lanes, seldom come together; for instance, as the fog curves run up, the gale curves, both for coming and going, come down, and *vice versâ*. This feature is very striking all the way from the meridian of 25° to that of 55°. These curves are both suggestive and instructive. Others have been added to show, also, the per cent. of calms, rains, and thunder and lightning, by each lane.

That you may judge also as to the relative frequency with which the parts of the ocean in which these two lanes are traversed by sailing vessels, I have projected them also on series A of the Wind and Current Charts.

You will observe by referring to this series, that the part in which the lane going lies, is very much frequented, but it is frequented mostly by vessels going. (See also Plates XI. and XII.) Those that are coming this way, that is to the west, seek, for the most part, to avoid the Gulf Stream, either by going to the north, or by taking what is called the southern route, which is very common, especially in winter. So that steamers, when in the lane going to Europe, will find the vessels generally all bound the same way, and likewise in the lane coming to America, the vessels seen, though not so many, will, for the most part, be steering to the westward. And when all are bound the same way, collisions are rare.

According to the tables given, pp. 293 to 304, the best routes for sailing vessels to Europe, as there determined, run along, for the most part, south of the line going, until you reach the meridian of 45°, between which and 40°, they cross this lane and run along between it and the other. These are the tracks that are projected on Plates XI. and XII.

I will close this report with a recapitulation as to distances and courses by each lane, between New York, Halifax, and Philadelphia on one side, and Cape Clear and the Scilly Isles on the other; first begging leave to say that, according to my computation, founded on such statistics as I have touching the velocity of the Gulf Stream, if two steamers bound for Cape Clear, and of exactly equal speed, were to start from Halifax, to see which should first get into the great circle part of the lane to Europe from New York, and

if one were to go straight for it by steering east, and the other were to follow the European lane from Halifax as projected on the Chart, this one would reach the point of destination quite as soon as the other, the drift of the Gulf Stream compensating for the greater distance.

DISTANCE BY LANE TO AMERICA.

		By Great Circle.
From Scilly Isles to Halifax	2,351	2,305
" " Capes of Delaware	2,948	2,909
" " Sandy Hook	2,882	2,840
From Cape Clear to Halifax	2,192	2,170
" " Capes of Delaware	2,789	2,765
" " Sandy Hook	2,723	2,695
" " Do. by actual average		2,754

This statement shows that by the lane to America the distance is actually shorter, both to Sandy Hook and, we may infer also, to the Delaware, than the average distance by present route; for the route actually pursued by the steamers now, both to Sandy Hook and the Delaware, may be considered the same from Cape Clear or the Scilly Isles, as far west as long. 70°.

DISTANCE BY LANE TO EUROPE.

	To Scilly Isles.	To Cape Clear.
From Halifax	2,436	2,285
" Capes of Delaware	3,024	2,873
" Sandy Hook	2,980	2,829

Besides the detour from the great circle which a vessel from New York, Halifax, Boston, or Philadelphia would necessarily make by following the European lane to Cape Clear, it would require an *additional* detour of only 15 miles for vessels bound into the English Channel to use it also as far as Cape Clear. This lane, therefore, will, in consequence of the favorable currents of the Gulf Stream, put a vessel into Southampton quite as soon as she could reach that port from New York or Philadelphia by the great circle route. Vessels from Halifax will have to make the greatest detour of any by adopting the lane to Europe; but for them it is less than 100 miles out of their way as they now go, and it will prolong their average passage eastwards, perhaps, two or three hours. I say *perhaps*, because I am not sure but that the steamers from Halifax and New England are set back by the cold current 20 or 30 miles on the route now used for the eastern passage. The Gulf Stream, even from where they will join it by this lane, will set them forward, on an average, 40 or 50 miles at the least. It seems, therefore, that the attractions of this lane as it regards safety should more than outweigh the *probable* loss of an hour or two during the passage. When I speak of distances by the lanes, it should be recollected that the *middle* of the lane is meant, as per following table of courses and distances:—

LANE TO AMERICA.

	Course.	Distance.
From Scilly Isles to Cape Clear,*	W. 33°.7′ N.	159 miles.
" Cape Clear to lat. 51°.23′, long. 15°.0′	1°.55′ N.	187 "
" lat. 51°.23′, long. 15°.0′ to lat. 51°.16′, long. 20°.0′	2°.17′ S.	187 "
" " 51.16 " 20.0 " 50.56 " 25.0	6.5	189 "
" " 50.56 " 25.0 " 50.23 " 30.0	9.50	193 "
" " 50.23 " 30.0 " 49.36 " 35.0	13.41	199 "
" " 49.36 " 35.0 " 48.33 " 40.0	17.45	207 "
" " 48.33 " 40.0 " 47.15 " 45.0	21.8	216 "
" " 47.15 " 45.0 " 45.38 " 50.0	25.10	228 "
" " 45.38 " 50.0 " 45.00 " 51.45	27.13	83 "
" "(*a.*)45.00 " 51.45 " 44.10 " 55.0	19.45	148 "
" " 44.10 " 55.0 " 42.40 " 60.0	22.27	236 "
" " 42.40 " 60.0 " 41.42 " 65.0	14.34	231 "
" " 41.42 " 65.0 " 40.30 " 70.0	17.45	236 "
" " 40.30 " 70.0 Sandy Hook,	0.43 S.	183 "
" " 40.30 " 70.0 to Capes of Delaware,	W. 22.8 S.	249 "
" "(*a.*)45.0 " 51.45 to Halifax,	3.53 S.	503 "

LANE TO EUROPE.

	Course.	Distance.
From Capes of Delaware to lat. 39°.40′, long. 70°.0′	E. 10°.46′ N.	236 miles.
" Sandy Hook to lat. 39°.40′, long. 70°.0′	E. 14.29 S.	192 "
" lat. 39°.40′, long. 70°.0′ to lat. 40°.31′, long. 65°.0′	.12.24 N.	237 "
" " 40.31 " 65.0 " 41.9 " 60.0	9.39	227 "
" " 41.09 " 60.0 " 41.33 " 55.0	6.5	225 "
" " 41.33 " 55.0 " 41.53 " 50.0	4.57	232 "
" "(*b.*)41.53 " 50.0 " 43.55 " 45.0	29.6	251 "
" " 43.55 " 45.0 " 45.46 " 40.0	27.28	241 "
" " 45.46 " 40.0 " 47.18 " 35.0	24.4	226 "
" " 47.18 " 35.0 " 48.32 " 30.0	20.18	212 "
" " 48.32 " 30.0 " 49.30 " 25.0	16.21	206 "
" " 49.30 " 25.0 " 50.14 " 20.0	12.46	199 "
" " 50.14 " 20.0 " 50.45 " 15.0	9.17	192 "
" " 50.45 " 15.0 to Cape Clear	E. 4.34 N.	189 "
" Cape Clear to Scilly Isles	E. 27.39 S.	151 "
"(*b.*)Halifax to lat. 43°.30′, long. 60°.0′	E. 20.7 S.	163 "
" lat. 43°.30′, long. 60°.0′ to lat. 42°.30′, long. 55°.0′	15.17	181 "
" " 42.30 " 55.0 " 41.53 " 50.0	9.28	225 "

* The courses and distances are for the *middle* of the lanes. See Charts.

Thus it appears that one lane will practically shorten the distance from Cape Clear to Sandy Hook and the Delaware, by 30 miles, while the other prolongs the distance going to Europe 75 miles, which prolonged distance, when measured not by safety, but *in time* alone, the Gulf Stream, better weather, and diminished frequency of fogs, will more than compensate for. In my judgment, these lanes, if properly followed, will make the average length of passage, as determined by the mean of all for the year, probably less each way, certainly not more than an hour or two longer than it now is. Individual passages coming will perhaps not be made so quickly as they have been, but on the average, trips will be shortened.

For a better understanding of the whole subject, I beg to refer to Plates XI., XII. and XXI., and have the honor to be, gentlemen,

Yours respectfully,

M. F. MAURY."

This subject is one of interest to all who use the sea, and the Board of underwriters, of New York, requested also to be furnished with a copy of the above. They gave their sanction to the recommendations therein contained, and ordered the reports and maps to be published in a convenient form for circulation. The gentlemen of Boston did the same. The following letter and the views contained therein, to the American Chamber of Commerce, of Liverpool, may be interesting to some:—

U. S. NAVAL OBSERVATORY AND HYDROGRAPHICAL OFFICE,

WASHINGTON, *Feb.* 20, 1855.

"*To the President of the American Chamber of Commerce, of Liverpool:—*

SIR: Nothing that tends to lessen the dangers of navigation between this country and Europe, can, I am sure, fail to be of interest on your side of the Atlantic, particularly to the people of England, and especially so to the merchants, ship-owners, and underwriters of Liverpool.

The loss of the steamer Arctic has left a deep impression on the public mind in this country, and caused inquiries to be set on foot as to plans, if not for preventing, at least for lessening, the liabilities to such accidents, and to collisions at sea generally, especially with steamers.

Among other plans, the idea of a double track for steamers, between the ports on this side, north of the Delaware, and the ports on your side, north of the Seine, was suggested; and at the request of the merchants, ship-owners, and underwriters of Boston, I have undertaken to project across the Atlantic two such "lanes" for steamers; a "lane" to go, and a "lane" to come.

After patiently wading through the abstract logs, containing observations on the wind and weather, sea and currents, for not less than 46,000 days, along the routes proposed, I have risen from the discussion refreshed with the conviction that two such lanes may be so planned and projected, that the steamers may, by adopting them, on the average actually speed their passage one way and probably not lose time on the other—and besides this, they will, if adopted, tend to make the navigation of the Atlantic more safe, and lessen the chances of collision by the way, between steamer and steamer, and steamers and sailing vessels.

I have the honor to inclose to you for the information of the Chamber, and of all whom it concerns, a copy of the Report, with its accompanying papers to the Boston people on the subject. The lanes, as there projected, are narrow at the beginning, because the steamer can always start fair; they gradually widen until they reach their greatest breadth, 20 or 25 miles for the lane to America, 15 or 20 for the lane to Europe. They attain their greatest breadth as they approach the Grand Banks—the fog region—where there is, on account of the want of observations, usually the most uncertainty as to the true position of the vessel, but fortunately these lanes run, for the most part, east and west, and therefore their breadth may be regulated according to the probable errors of latitude, without much regard to those of longitude, for in parts of the lanes, vessels may be several degrees out in longitude, and the error, though undetected, will not put them out of the lane.

The skilful navigator generally knows, within a few miles, what the latitude of his vessel may be; the uncertainty amounting usually, to not more than ten miles; but occasionally to twenty or thirty, or even more, according to the weather and the time that may have elapsed since the previous observation. When the sky is clear enough to afford the necessary observations, the latitude may, at all times, be known certainly within five miles, generally less. Admitting, therefore, on board the steamers, a probable error of latitude not amounting, except in rare cases, to more than from seven and a half to twelve and a half miles; we shall have for the lane to America, the more foggy of the two, a breadth of twenty or twenty-five miles in the widest part, and for the one to Europe a maximum breadth of not more than fifteen or twenty.

With this breadth and with proper care and attention to the navigation, the steamers will generally be enabled to keep within the lanes. Storms and ice, or a succession of days without an observation, may now and then lead them astray or put them out, but such cases will be exceptions to the rule, and even when they occur, the steamer will be in no more danger of collision than she is now daily when at sea, only when she gets back into the lane she will be in less. The lanes, therefore, it will be perceived, have been laid off to suit the rule, not to meet the exceptions.

In practice, benefits and consequences will probably flow from the adoption of these lanes, which are not anticipated, and among their collateral bearings, I may be allowed to mention one that has already been suggested by a friend. It is with regard to vessels and people in distress at sea. Here are these two highways across the Atlantic, along which steamers will be passing every few days, perhaps, in time to come, daily. Now a sailing vessel that finds herself disabled in mid-ocean, or people who, in that part of the Atlantic where these lanes lie, are compelled to take to rafts or boats, have but to make the best of their way to the most convenient lane, where they may certainly expect to speak a steamer and make known their wants.

So altogether, although I commenced to investigate these lanes merely as a device tending to the prevention of collisions at sea, I find them in this point of view standing out in bold relief, as a new resource in the middle of the ocean, which sailing vessels will have in case of distress there.

The distance between these two lanes on the meridian of the Grand Banks, is about two hundred

miles; the northern one of the two, passing about one hundred miles south of Cape Race, and thus avoiding the dangers and delays to which steamers are now liable, when they approach the cape in thick weather, and after an uninterrupted succession of days without an observation. Owing to the detour, which the steamers that try the great circle, and aim to shave Cape Race, have to make when they approach that cape, under these circumstances, the distance sailed, on the long run, is actually greater than it would be, if they were to adopt a route, which, like the lane from Europe, would not pass within one hundred miles of Newfoundland, and from which no deviation need ever be made to avoid the shore.

Moreover, this lane has a further advantage in its favor. It lies more along with the eddy of the Gulf Stream than the Cape Race route does, and this eddy is often found to set vessels to the westward at the rate of eighteen or twenty miles a day, for several days in succession. Moreover, the distance by the lane from Cape Clear to Sandy Hook, is only twenty-eight miles greater than it is by the shortest distance that it is possible for a steamer to make between the two places; and it is thirty miles less than the distance which they actually do make on the average.

The distance between the same two points by the lane to Europe is only seventy-five miles greater than it is by the same average, with these conditions additional in its favor: less danger, less ice, less foggy weather, and consequently clearer skies, better navigation, better speed and more safety, and last, but not least, the set of the Gulf Stream, which, in the long run, will, I am induced to believe, make up for this difference of seventy-five miles. Indeed according to the computations, that the data before me enable me to make, I estimate that the set of the Gulf Stream, will help the European-bound steamers along, in this lane, at the rate, taking one season of the year with another, of one hundred or one hundred and twenty miles, during the passage.

These lanes, therefore, may be adopted with signal advantage to all those who use those parts of the ocean in which they lie; and much depends upon the course which Liverpool may pursue with regard to them. We look to her shipmasters and owners, to her merchants and underwriters, for co-operation in this humane attempt to lessen the dangers of the sea; and the plan is so simple and easy of practice, that I cannot believe we shall look in vain to good men anywhere, for sympathy in this work. Among the steps which I ask leave to suggest for the consideration of those on your side of the water, that are interested in this scheme, are the following:—

Let the hydrographers and chart-makers on the Continent, as well as in England, be requested to engrave these lanes on their general Chart of the Atlantic, with a note recommending steamers to use them as much as possible, and sailing vessels likewise to keep out of them except for crossing. Let owners and companies enjoin the same upon the masters of their vessels. Let underwriters require, as a condition to insurance, that one of these Lane Charts shall be on board every vessel insured. And let shipmasters endeavor—those of sailing vessels to leave the lanes as much as they conveniently can to the use of the steamers—and those of the steamers to keep out of the way of sailing vessels as much as they can by keeping their ships in the part of the ocean thus generously abandoned to their use. By these means, I

conceive, these lanes may gradually be established as the recognized routes for steamers. If, moreover, the steamers using these lanes will be careful to record the proper observations as to the wind, weather, and currents encountered in these lanes, and return their abstract logs regularly, either to Captain Fitzroy of the Marine Department of the Board of Trade, London, or to myself, I doubt not, in the course of a year or two, we shall be enabled finally to decide the question as to the possibility of improving the location of these lanes. They have been laid off according to the lights we have. Experience may give us additional ones. You will find in the accompanying papers a further discussion of the subject, and, therefore, it is useless to go over the views that are presented there.

New York to New Orleans.

Capt. Wm. C. Berry to Lieut. Maury—New York, Feb. 1, 1851.

Having had long experience in the trade between New York and New Orleans, I herewith furnish you with a few remarks on wind and currents. For the last six years I have commanded the ship Vicksburgh, constantly trading between these two ports. In making the passage out, after passing the Hole-in-the-Wall, I have frequently found a current from 1 to 3 miles per hour, setting to the eastward through the northwest channel of Providence, particularly after the wind has prevailed from the westward a few days. This, no doubt, has been the cause of putting a number of vessels on shore among the Berry Islands. I have latterly made it a point to take the last bearings of the light on the Hole-in-the-Wall, and either haul up or keep off as I found the current; generally running on a west course until quite down with Little Stirrup Keys, then steering W. by N. ½ N., by compass, if in the night, until I was up with the Great Isaacs. The last three voyages, having reached the vicinity of the Little Isaacs in the daytime, I have hauled in on the bank between the western Little Isaacs and the east Brother Rock, and steered S. W. by W., by compass, which has brought me out in good passing distance from the Moselle Shoal. During one of my summer passages out, after passing the above shoal, I was compelled to anchor, and remained there for six days. The wind during all this time was light from the southward, and I could not help remarking the regularity of the current setting along the Bemini Islands, ebb and flow, about two miles per hour. This continues as far as Gun Key, when it is broken off by the Gulf which sets close into the Key. From this point up to Orange Key, when close in, little or no current is experienced, except the ebb and flow, which is directly off the bank. In crossing the Santaren Channel, the current is governed greatly by the winds; with strong southerly winds the current sets about N. N. W., two miles per hour; on the other hand, with strong northerly winds, little or no current is felt. After leaving the Double-headed-Shot Key, I have generally hauled over for the Florida Reef, and in the daytime kept close in, when I have frequently found an eddy current setting to the westward from 1 to 1½ miles per hour. After passing the Tortugas, I have invariably felt a southerly current until I had reached the long. of 84°

30′ W., and even farther than this at times, as will be seen by referring to my journals, particularly in November, 1848. Returning from New Orleans, I have always made it a point to keep to the westward until I had reached the long. 85°, lat. 28° before keeping off. My object in doing this is, that the wind here generally prevails from the northward and eastward, and that the current generally sets to southward and eastward, which greatly facilitates the passage. After rounding the Tortugas, with the wind from the eastward, I have generally beat down on the Florida side, knowing that the strongest current prevails on that shore, unless too close in. From Carysfort Reef to Mantanilla, I have always endeavored to keep in the centre of the stream. During all my voyages, I have made it a rule to steer from Mantanilla to latitude 22°, N. by W., and then north to latitude 31°, before hauling up N. E. by N.; by so doing I have, with a few exceptions, kept the strongest current. On some other occasions, I have hauled up on a N. E. by N. course, when in latitude 30°, longitude 79° 40′, and have soon found myself on the eastern edge of the gulf. After rounding Cape Hatteras, it is advisable to keep to the westward, especially in the winter season, on account of the prevailing westerly winds.

Sailing Directions for the Coatzacoalcos River.

Capt. Foster, of the Alabama, to Lieut. Maury.

Sailing vessels bound for the Coatzacoalcos ought to make the land to the eastward. This precaution is necessary on account of the prevailing trade-winds, which cause a strong westerly current; also in case of a norther, to have the advantage of sea-room. The entrance to the river may be known by the vigia or tower situated upon the western side; likewise from the sand cliffs extending from that point to the westward.

The best mark for crossing the bar is to bring the tower* to bear S. ¾ W. by compass. Having passed the bar, haul up to the east of south, and steer in midway between the two points that form the entrance to the river. The wind, after crossing the bar, often falls to calm; for this reason it is necessary to have an anchor ready to let go, as the current on the ebb, even in the dry season, sets out strong.

The extent of the bar, east and west, is about 220 fathoms, and the width, by actual measurement, 108 feet. The bottom, composed of sand and clay, is hard, on which account it is not liable to shift. It forms in hard northerly gales a narrow barrier of breakers, and cannot be crossed without imminent risk. The depth at high water, on full and change, is about 13 feet, and falls as low as 10½ feet. The general depth, however, is twelve feet, from which it suddenly deepens to 5 or 6 fathoms.

Except in heavy weather, there prevails a regular land and sea breeze. The latter sets in between the hours of 9 A. M. and noon.

April, 1851.

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* This tower, of great solidity, is destined to last for ages.

PASSAGE FROM THE CAPE DE VERDES TO THE S. W. COAST OF AFRICA, WITH REMARKS UPON THAT SECTION OF THE COAST.

Letters of Lieutenants Foote and Porter.

UNITED STATES BRIG PERRY,
St. PAUL DE LOANDA, *May* 17, 1851.

SIR: In a letter addressed to the commander of any U. S. vessel who may come to the southern coast, I have inclosed a copy of notes drawn up by Lieutenant Porter, who has cruised on the southern coast of Africa, severally in the Marion, John Adams, and this vessel.

I transmit a copy of these notes (which fully accord with my own observations and experience), under the impression that they may be available in the Hydrographical Department.

I have the honor to be,
Very respectfully, your obedient servant,
ANDREW H. FOOTE,
Lieut. Commanding.

COMMODORE LEWIS WARRINGTON,
Chief of the Bureau Ordnance and Hydrography.

Lieut. W. C. B. S. Porter, U. S. N., to Andrew H. Foote, Lieut. Commanding U. S. Brig Perry.

LOANDA, *May* 17, 1851.

In the season of February, March, April, and May, there is no difficulty in making the passage from Porto Praya to Ambriz in thirty days, provided the run from Porto Praya to Monrovia takes not more than eight days.

The direct route, and that which approaches the great circle, leads along the coast, touching the outer soundings of St. Ann's Shoals, thence to Half-Cape Mount, to allow for a current when steering for Monrovia. From there, follow the coast along with the land and sea breezes, assisted by the current, until you arrive at Cape Palmas; keep upon the starboard tack, notwithstanding the wind may head you in shore (the land breezes will carry you off), and as the wind permits, haul up for 2° west longitude; cross the equator here, if convenient, but I would not recommend going to the westward of it; you will encounter westerly currents from thirty to fifty miles a day. In the vicinity of Prince's Island, the S. W. wind is always strong. In the latitude of about 1° 30′ N., there is a westerly current. Should it not be practicable to weather the Island of St. Thomas, stand on, approach the coast, and you will meet with north winds to carry you directly down the coast. Our Salem vessels make the passage from the United States in 56 days, arriving at Ambriz in May. I have made three different cruises to this coast in the same season, in the Marion, John Adams, and Perry.

The impulsive desire to attain the object of our duty will, as much in nautical matters as others, mislead our better judgment, when there is a prospect, or any temptation to success, without experience to forewarn us. Thus, our vessels, after arriving at Cape Palmas, have generally gone upon the port tack,

because the wind carried them towards the coast or Gulf of Guinea, and seemed to favor them for the port tack the most; which, on the contrary, although slowly veering towards the S. E., was hauling more ahead, and leading them off into a current, which, under a heavy press, it is impossible to work against. The consequences were, they had to go upon the starboard tack, and retrace the ground gone over. On the starboard tack, as you proceed easterly, the action of the wind is the reverse, and it allows you to pursue the great circle course.

It employed the Marion eighty odd days to Kabenda, a port 200 miles nearer than Ambriz; to which port (Ambriz) from Monrovia, in this vessel (the Perry), we went in 23—making 31 from Porto Praya. In the John Adams, 10 to Monrovia, and 46 to Ambriz, by the way of Prince's Island; about 10 of which was lost working to the south of Cape Palmas. From Cape Palmas to the point of crossing the equator the current is easterly—south of that westerly.

The practice along the coast in this vessel (the Perry), was to keep near enough to the land to have the advantage of a land and sea breeze, and to drop a kedge whenever it fell calm, or we were unable to stem the current. Upon this part of the coast, near the Congo, the lead line does not always show the direction of the current which affects the vessel. On the bottom, there is a current in an opposite direction from the surface; therefore, before dropping the kedge, the better way is to lower a boat and anchor her, which will show the drift of the vessel. Between Ambriz and the Congo, I have seen the under current so strong to the S. E., as to carry a 24 pound lead off of the bottom, while the vessel was riding to a strong S. W. current; but the under current is the strongest.

In crossing the Congo, I would always suggest crossing close to its mouth, night or day; going north with the wind W. N. W., steer N. N. E., with a five or six knot breeze, when you strike soundings on the other side you will have made about a N. ½ E. course in the distance of 9 miles, by log from 11½ fathoms off Shark Point. The current out of the river sets west about two knots the hour. With the land breeze it is equally convenient; and may be crossed in two hours. In coming from the north, with Kabenda bearing N. E., in 13 fathoms, or from the latitude of 5° 48′, wind S. W., a S. S. E. course will carry you over in four hours outside of Point Padron; and by keeping along shore, the current will assist you in going to the south. Vessels which cross to seaward from latitude of 5° 45′, and 9° W., are generally six days or more to Ambriz; by the former method it occupied us (the Perry) only two days.

General Remarks on the Passage from the United States to Ports beyond the Equator.*

It has now [March, 1855] been about eight years since I first proposed a new and shorter route hence to the equator, for all vessels, whether bound around the Cape of Good Hope, Cape Horn, to Rio, or to any of the ports of South America. The tracks of all such are the same until Cape St. Roque be cleared.

* Originally submitted in 1849.

The W. H. D. C. Wright (Jackson), of Baltimore, was the first vessel to try the new route. In 24 days from Hampton Roads, she crossed the line in 31° W., and had a passage of 13 days thence to Rio. This was in February, 1848.

In May, she went out again, had 33 days to the line, which she crossed in 33° 41′ W. In 3 days after, she cleared St. Roque. On this passage, she was detained 6 days by calms between 8° 30′ and 5° N. But she had no difficulty, it will be observed, in weathering Cape St. Roque. This trip it took her 11 days to clear the equatorial calms, which she found between 9° N. and 3° N.

In the spring of 1849, she went out again. She had 32 days to the line in 28°, after having been delayed 9 days by calms between 5° N. and the line; whence, in 3 days, she again cleared Cape St. Roque. The average, therefore, of Captain Jackson's passages to the line, by the new route, was 30 days, against 41 by the old route.

The Chicora, the Helena, and the Midas tried this route about the same time, and all with equal success; their average to the line being 26 days only.

These practical demonstrations of the advantages of the route which I had pointed out were not wanting to satisfy me of their value, for I had consulted many thousand records as to the winds encountered in this part of the ocean by different vessels on different occasions. These records show the number of times on which the winds had heen found to blow from each point of the compass in different parts of the ocean. And knowing the prevailing winds for each 5° square, the navigator could tell what course it was practicable for a vessel to steer through these squares, as well before as after the trial had actually been made.

For instance, in a certain square of 5°, I obtained the records of 700 vessels during the month of August in different years. Vessels, bound south by the old route, were in the habit of passing through this square, always aiming to make a S. S. W. or south course through it. And of these 700 records as to the wind, 600 gave the wind directly ahead for the south or S. S. W. course. To convince any one, then, who believes in the records examined, that a vessel in this part of the route to Rio would *generally* find the winds ahead, did not require that a vessel should be sent there actually to try it, for here was the experience of 700 vessels, 600 of which had found the winds adverse for a southerly course.

But certain navigators were not disposed to look upon my investigations in this light. Forgetting that they were the results of actual observations, these persons were disposed to consider those results, thus announced, as theories, or matters of opinion of my own; whereas, they are no more matters of opinion, than the fact that the trade-winds blow is a matter of opinion. They are nothing more or less than the sum of the experience of some thousands of navigators, as to winds and calms.

The effect has been that, though many shipmasters have at once perceived the bearing of these results, and the correctness of the conclusions derived from them, and have readily adopted them, still, others have rejected them altogether, or only partially adopted them.

It has not unfrequently happened, as I perceive by the log-books returned to me, that occasionally a navigator will put to sea, and stand boldly out for the new route. But after awhile, the wind comes out ahead. He then gets frightened, abandons it, has a long passage, and lays the blame to the new route.

I have never claimed for any of these routes an exemption from liability to head winds. On the contrary, I expressly show that a vessel, by any of the routes proposed by me, is liable both to head winds and calms; and not only so, I have shown the chances of both against her. The best navigators, even in smart ships, may now and then have tedious passages by following these routes. It is not claimed that they will, invariably and for each ship, give short passages; but it is claimed and has been proved that, in the long run, they will give very much the shortest passages.

I may here remark that I have never yet heard of a navigator complaining of the new route, and a long passage by it, but what, when his abstract log came to be examined, it did appear that the fault was quite as much with him as with the route. For instance, I have drawn (Plates XI. and XII.) certain lines or tracks to show the route recommended. These lines are intended to show the route that vessels should take, not the *track* that they should make. Vessels taking such routes, should be guided by these lines as to the general direction which they ought to pursue. It was never intended that, with fair winds, they should make the zigzags of these lines. But some navigators have inferred that there was virtue in these lines themselves; that they must be followed as rigidly and as closely as though they marked out a channel-way, on either side of which if a vessel should fall, she would find herself in difficulty. Accordingly, abstracts that have been returned to me, show frequent instances wherein vessels, after having been headed off from the projected track, have had the winds perfectly fair for pursuing their straight course onward; yet they have, nevertheless, proceeded to make a head wind of such, and to beat back out there on the open sea, for the purpose of getting back on the track projected.

Suppose that ship A makes an uncommonly quick run to a given port, and that she gives her track to B; B attempts it but is headed off. Now B, from this new position, will not attempt to go out of his way to get actually in the wake made by A; but B will shape his course by that of A, and run by it; and consider that he is following it, when he is near it. This is what I wish vessels to do with regard to the routes that I have projected for them. Do not go out of your way to get on those tracks, but consider yourself, unless specially directed otherwise, to be in good position, according to the quantity of sea-room, when you are within one or two hundred miles of the projected track.

Therefore, when you are *near* the projected track, consider yourself in as good a position as though you were actually on it.

The greatest average by the old route is for July, which is 48 days; the most tedious month by the new route is August, which gives 37 days as the average.

When a vessel finds herself pinched for room, she should never hesitate to pass inside of Fernando de Noronha, and vessels bound around the Cape of Good Hope, will find it to their convenience to cross the equator somewhat further to the east than they would if bound to South America or around the "Horn."

The most pertinent question for the navigator to ask, with regard to the route hence to the southern hemisphere, is not, "Where shall I cross the equator?" but, "Where shall I lose the N. E. and where get the S. E. trades?"

Hence, it will be observed that, by following these Sailing Directions, vessels will occasionally be

compelled to go as far east as longitude 25° W.; but this is north of the equator, and in those regions and months when and where the N. E. trades usually fail.

I give, with all their mistakes, the passages of 342 vessels that have attempted the new route; compared with those taken at random, that have gone by the old route. The result is, that the routes which I have proposed, and which were followed by these 342 vessels—many of them doubtingly—have reduced the average sailing distance, from the ports of the United States to the equator, as much as two weeks for some months, and 10 days on the average, the year round.

The average passage to the line, the year round, by the old route, is 41 days; by the new 31;* thus exhibiting a saving of nearly 25 per cent. of the usual time under canvas hence to the equator; which saving is among the first fruits of the Wind and Current Charts, and of that system of investigation, with regard to the winds and currents of the ocean, that the patriotism, intelligence, and public spirit of American ship-owners and masters have enabled me to pursue with such signal advantage to the commerce of the country, and which is now attracting the attention and labors of the maritime world.

Since the first publication of the Wind and Current Charts, the materials for improving them have increased with great rapidity. These materials have been so discussed and arranged, by the officers at the Observatory, that, with the aid of the Pilot Charts, the navigator may now calculate and project the path of his ship on an intended voyage, very much in the same way that the astronomer determines the path of a comet through the heavens. There is this difference, however; the Chart with its data shows the navigator that, in pursuing his path on the ocean, head winds and calms are to be encountered, which will turn him aside, or retard him on his way; and that, therefore, he cannot predict with certainty the place of his ship on a given day. He therefore, in calculating his path through the ocean, has to go into the doctrine of chances, and to determine thereby the degree of probability as to the frequency and extent with which he may anticipate adverse winds and calms by the way.

Thus, in the five degrees square of the ocean, between latitude 35° and 40° N., longitude 70° and 75° W., the log-books of 4,387 vessels, or the records of vessels for 4,387 days in this square, have been examined; 323 of which were there in the month of February of different years.

Now, supposing (and there is no reason to suppose otherwise) that these observations give a fair average as to the prevalence of calms, and the direction of the winds; we are led to the conclusion that, if one of these vessels had attempted to sail through this square one hundred times on an E. S. E. course, in the month of February, for a series of years, she would have had 6.2 calms, fair winds 85.5, and 1.3 wind *dead ahead*, or at E. S. E.; that she would have been headed off on the larboard tack, or by "slant" winds from the northward and eastward, 7.3 times; and on the starboard tack, or by "slant" winds from the southward, 5.9 times.

From this, the navigator will see, also, that, along this part of the February route, the northern side is

* This was written and published several years ago. Since that time navigators have learned to follow the new route better. Twenty days is now not an uncommon passage from New York to the line, and some of the new ships talk of making it in 16. It has been made in 18.

rather the windward side; and that, therefore, when winds are *free*, it is better to keep along this part of the route, somewhat to the north of the projected line.

After crossing latitude 20° N., longitude 40° W., he will likewise see that he is there still liable to be headed off by winds from the northward and eastward; and that, consequently, when the wind comes out *dead* ahead, he should stand off on the starboard tack; and that, when the winds are fair, he should keep the projected track to the southward and westward of him, say generally 40 or 50 miles.

He is recommended to steer straight from *d* to *d* when the winds are fair; and when he gets thrown off his course, instead of getting out of his way to get back to the projected track, he should be guided by the Pilot Chart, and run parallel to this track, or otherwise, according to the Pilot Chart.

Similar tables, with complete sailing directions, are in the course of preparation for every month, and all the principal routes across the ocean.

These present tables from that publication are given for the information especially of those navigators who are bound on voyages beyond the equator.

Those who desire to try these routes, should project the route for the month on the Chart as far as the equator; arrived there, let a line be drawn from the point of *actual* crossing to Cape St. Augustine; and then aim to keep this line under the *lee*, so as to have it at least 20 or 30 miles to the westward when the ship crosses the parallel of 6° or 7° south.

After that, the winds haul more to the eastward, and there will be no difficulty in laying up S. S. W., or even as high as south.

If the ship be headed off to the west of her course or to the west of said line to St. Augustine, she should take advantage of the first "slant," tack, stand east, and make short and long legs until she can clear the land.

This part of the route is the turning-point of the passage. By studying the Charts as well as the tables, navigators will see, that, with attention and management between the equator and 6° south, they will have little or no difficulty in making either a S. S. W. course good on one tack, or an east course on the other; and when they find it necessary to stand to the eastward, they should never stand farther, unless they can make southing also, than to bring, 20 or 30 miles to the leeward of them, a straight line, drawn from 31° on the equator, just so as to clear the land about Cape St. Augustine. In this part of the route, more than in all others, the navigator should study the *slants*, and take advantage of all of them.

I recommend these routes, it should be understood, only to vessels which can sail within six points of the wind. I would not advise any vessel that cannot do this, to attempt them, for she will be apt to fall to leeward, and then she will find it difficult and tedious to get up again.

There are other parts of the routes in which it is also necessary to study the "slants." For instance: take that part of the February route which lies between the parallels of 20° and 15° N. It will be observed that though but one of the 25 observations from which this part of the route is determined, gives the wind *directly ahead*, yet that 8 per cent. of them are "slant" winds from the eastward, which will prevent a vessel 8 times in 100 from lying S. S. E., the course prescribed.

After crossing 15°, it will be seen that the navigator will have, if the observations consulted give a fair average as to the direction of the wind, neither head winds nor "slants," until he gets 5° N. Thence to the equator he is liable to be headed off to the westward 14.7 times in 100. He should, therefore, in this month aim, if the winds allow, to keep this part of the route under the lee, so as to cross 5° N. to the east of 31°.

By *slants*, I mean winds that, though not *dead* ahead, will, nevertheless, head a ship off her course; thus, for a vessel that wishes to head E., a wind at N. N. E. or N. E. would be what here is called a *slant* wind.

The route for each month is computed according to the doctrine of chances; the numbr of observations from which each part of the route is calculated is stated in the last column, "Total number of observations."

It will, therefore, be perceived that some parts of each route are entitled to more weight than others. Thus, the percentage of fair and adverse winds for the first course on the December track is derived from 364 observations, whereas that for the fifth course is derived from only 26. All will admit that 364 give a better average than do only 26 observations.

It must be farther presumed and admitted that vessels may expect, in following any one of these routes, *sometimes* to encounter head winds and calms, and have long passages.

But, taking the average length of passage by these routes, the data of the Charts lead us to the conclusion that a fair sailer, under good management, will run in December from 31 to 36 days from the Atlantic ports to the equator; in January, from 30 to 35 days; and in February and March, from 19 to 27 days, against 41 days by the old or usual route.

Navigators who are disposed to try these routes should have the Pilot Charts on board; which Pilot Charts will be furnished to them on application, either at the National Observatory at Washington, or to George Manning, No. 142 Pearl Street, New York; provided the applicant will agree to furnish this office an abstract of his log according to the form with which he will also be gratuitously supplied, and which form may be found in another part of these Directions.

Vessels from other ports of the United States, besides New York, are recommended to make the best of their way to the track from New York. They should generally be governed by the winds they happen to meet as to where they will intercept this track. If vessels from southern ports aim to intercept it to the S. of 33° N., they will be liable to encounter the calms of the horse latitudes.

NATIONAL OBSERVATORY, *Washington*, *December* 14, 1849.

In the above, the first edition of the Pilot Charts is referred to for illustration. The second edition, which is now (March 1855) out, contains more observations for this part of the route.

In coming out, especially from New York and Boston, with *fair winds*, the navigator who is bound into the southern hemisphere will do well, as long as the winds are fair, to stand east, and not to attempt to make any longitude until he reaches the meridian of 65° or 60° west. This should be done only when the winds are fresh and fair.

Best average Routes from New York to Rio, and Ports beyond the Equator.

New York to Rio.—December.

Latitude.	Longitude.	Course.	Distances.			Winds; per cent.					Total No. observations.
			True.	Per cent.	Average.	Head.	Slants from N'd or E'd.	Slants from S'd or W'd.	Fair.	Calms.	
From 40° 27′N.	74° 00′to										
39 12	70 00	E. S. E.	200	7.0	214	2.1	7.2	4.5	86.2	3.0	364
39 12	65 00 *d*	E.	233	6.4	248	2.0	5.0	7.0	86.0	1.5	195
35 12	60 00	S. E.	338	7.2	363	0.8	8.8	8.8	81.6	0.8	119
35 00	59 24	E. S. E.	31	10.9	34	4.0	7.0	7.0	82.0	1.0	100
33 29	55 00	E. S. E.	237	6.4	252	4.0	0.0	0.0	96.0	0.0	26
33 29	50 00 *d*	E.	350	3.7	259	0.0	0.0	*w* 9.2	90.8	0.0	44
31 44	45 00 *d*	E. S. E.	275	9.3	300	3.9	7.8	6.5	81.8	7.5 *e*	75
30 00	43 00	S. E.	147	24.8	183	6.4	16.8	*w* 26.4	50.4	2.4	121
25 00	43 00	S.	300	9.6	329	2.0	12.0	12.0	74.0	6.0	48
22 16	40 00	S. E.	232	9.0	253	3.4	*w* 13.6	0.0	83.0	3.4	29
20 00	37 34 *d*	S. E.	192	7.5	206	0.0	*w* 19.5	6.5	74.0	1.3	79
15 00	35 24	S. S. E.	325	4.3	339	0.0	*w* 7.2	4.8	88.0	2.4	42
14 37	35 00 *d*	S. E.	33	22.9	41	11.1	*w* 14.8	0.0	74.1	0.0	27
10 00	35 00	S.	277	1.4	231	0.0	*w* 6.0	0.0	87.0	0.0	25
5 00	30 00 *d*	S. E.	424	13.1	479	2.0	*w* 26.0	14.0	58.0	10.7 *e*	50
Equator	32 04	S. S. W.	324	3.0	334	1.4	4.2	0.0	94.4	4.0	71

Shortest distance to the equator by this route, 3,918 miles; average distance to be sailed on account of adverse winds, 4,115. Ship Bothnia, Captain Avery, in December, 1850, accomplished it in 29 days, and 4,077 miles per log.

It is only about in the proportion of 1 to 2 that a vessel in this part of the ocean can make a S. E. course between the parallels of 10° to 5° N. Therefore, vessels going the December route should generally aim to cross 10° N. to the east of 35° W.

These tables have been before navigators for several years; ships are now found consulting them daily, and shaping their course by them. With a view of affording practicable examples as to the speed of vessels that have tried this route, I quote tracks from logs of such vessels, taken at random.

December Tracks.

Clipper Ship Contest, from New York, bound to San Francisco, fifteen days out.

Dec. 2, 1852. Lat. 20° 44′ N.; long. 36° 30′ W. Winds: south, south, S. S. W.* This day comes in with squally weather and rain; middle part, wind all about the compass in squalls, with heavy rain; latter part, light.

Dec. 3. Lat. 19° 52′ N.; long. 35° 32′ W. All this 24 hours, light airs, variable from S. S. W. to S. S. E., with more unsettled weather; ends calm.

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* In these extracts, the winds are quoted three times (first, middle, and latter part) for each day.

Dec. 4. Lat. 19° 01′ N.; long. 36° 31′ W. Throughout these 24 hours, light, baffling airs, from south, S. S. E., and west, to a calm.

Dec. 5. Lat. 17° 24′ N.; long. 36° 39′ W. Winds: S. S. E., S. E., E. S. E. Light winds, and pleasant, trade-like weather.

Dec. 6. Lat. 14° 22′ N.; long. 35° 26′ W. Commences with fine, settled, pleasant weather, with moderate trades from E. by S. to E. by N. I do not like my being so far to the west; feel as though I shall be bothered to fetch by the cape; but I shall go boldly on, and do the best to make a run.

Dec. 7. Lat. 10° 35′ N.; long. not observed. Comes in light from E. by S. to east and pleasant; middle, brisk from E. by N.; latter, moderate.

Dec. 8. Lat. 8° 30′ N.; long. 31° 34′ W. Winds: E. by N., E. by N., S. E. Begins with pleasant trades, with fine weather; middle part, fresh and cloudy, with a swell from S. E.; latter, squally, with calms between squalls.

Dec. 9. No observations. Wind: E. S. E., E. N E., east. First part, squally, with rain; middle, brisk; ends, next to a calm. Up to this time it has rained every day but four since leaving port.

Dec. 10. Lat. 5° 01′ N.; long. 29° 30′ W. Winds: calm, east, S. S. E.; first part, calm; middle and latter, light, with rain squalls.

Dec. 11. Lat. 4° 3′ N.; long, 30° 00′ W. Winds: calm, calm, east. First and middle parts, calm, and constant rain; latter, light breezes, with rain squalls. The weather very sultry and hot, as much so as I ever experienced.

Dec. 12. Lat. 1° 52′ N.; long. 30° 17′ W. Winds: S. E. First part light and rainy; middle, squally, with rain, and very baffling; latter, moderate and pleasant. Current, 12 miles S. E.

Dec. 13. Lat. 0° 26′ S.; long. 31° 06′ W. Winds: S. E., S. E. by E. First part, light airs; middle, baffling; latter, fine, settled, trade-like weather. Crossed the equator in 27 days; think I have done well, for the chance that I have had for making a passage.

Dec. 14. Lat. 3° 37′ S.; long. 32° 07′ W. All this day brisk trades from S. E. by E., to S. E. by S. Close-hauled.

Dec. 15. Lat. 6° 56′ S.; long. 32° 50′ W. Winds: S. E., S. E. by E. Moderate. Middle and latter parts, brisk.

Dec. 16. Lat. 10° 26′ S.; long. 34° 15′ W. Winds: S. E. by E., and E. S. E. First part, brisk trades; middle and latter, moderate and pleasant.

Captain Whitmore to Lieut. Maury.

San Francisco, *March* 26, 1853.

Sir: Inclosed is an abstract of the ship Tingqua, from New York to this port, which I forward according to your request. I have, on this passage, followed your directions as near as possible, and have no reason to regret it. Was unfortunate on this side of the line; but, on inquiry, I do not think my crossing could have been better. On comparison of logs with other ships, I find I gained considerable by

being in shore from the River La Platte to Cape Horn. A ship arrived here last evening from Boston, had 64 days to the line, which she crossed in 26° longitude; and a number have come under my observation in this passage, who were in the same difficulty. The clipper ship Alboni sailed some days previous; the Living Age, Tuscany, and Sacramento sailed in company with me, and have not yet arrived. I leave this port for Hong Kong on the 29th inst., and during the passage shall make all the observations practicable.

Ship Tingqua (S. D. Whitmore), New York to San Francisco. Nine days out.

Dec. 3, 1852. Lat. 28° 23′ N.; long. 42° 10′ W. Barometer, 29.90; temperature of air, 74°; of water, 75°. Winds, throughout, N. N. E.; fresh breezes and fine weather. All sail set. Barometer rising, and every appearance of trade-winds, although I do not expect them yet; if so, I am afraid we shall have them light, and far to the southward.

Dec. 4. Lat. 24° 36′; long. 40° 00′. Barometer, 30.00; temperature of air, 78°; of water, 76°. Winds, throughout, from N. E.; moderate breezes, steady, with light squalls of rain. Barometer, steady. Sure of the trades. Here is where I ought to have struck my line from Sandy Hook, but was anxious to get to the eastward.

Dec. 5. Lat. 22° 16′ N.; long. 39° 19′ W. Barometer, 29.95; temperature of air, 78°; of water, 76°. Winds: first part, N. N. E.; middle part, E. N. E.; latter part, E. S. E. Commences light, baffling breezes, and fine weather; throughout the night, light, baffling airs.

Dec. 6. Lat. 19° 23′; long. 39° 27′. Barometer, 30.00; temperature of air and water, each 79°. Winds: first part, E. S. E.; middle part, S. E.; latter part, S. S. E.; light airs and baffling, with light squalls of rain. A heavy squall from N.; am afraid it is going to be as I conjectured, very light trades—wrong time of the moon. This time last year, I had double reef breezes from E. N. E.

Dec. 7. Lat. 16° 17′; long. 38° 47′. Barometer, 29.90; temperature of air, 79°; of water, 79°. Winds: first part, S. E.; middle part, S. E.; latter part, S. E. by S. Light breeze, and fine weather. I wish I was 3° further east; however, I will keep on, and trust to Maury.

Dec. 8. Lat. 13° 7′; long. 36° 45′. Barometer, 29.90; temperature of air and water, 79°. Winds: during the first and middle part, E. S. E.; latter part, E. by S. Strong breeze, and a heavy head sea. Rigging much slackened; obliged to tack to the northward two hours to get a pull of the weather rigging. Two weeks out; distance sailed, 2,666 miles.

Dec. 9. Lat. 11° 25′; long. 36° 00′. Barometer, 29.85; temperature of air, 79°; of water, 80°. Winds: during the first and middle part, E. by S.; latter part, E. Strong breeze, and dark cloudy weather; glass falling; heavy head sea; all sail set.

Dec. 10. Lat. 9° 9′; long. 33° 50′. Barometer, 29.80; temperature of air, 78°; of water, 79°. Winds: first part, E. N. E.; middle part, E. by N.; latter part, E. S. E. Strong breeze, and dark squally weather, as I believe is always the case in this parallel. Winds inclining to the northward. Barometer still falling; latter part, wind heading; heavy squall from the S. S. E.; fear these trades are done; have recovered Maury's track.

Dec. 11. Lat. 7° 5′ N.; long. 32° 30′ W. Current, ½ knot W. Barometer, 29.80; temperature of air, 79°; of water, 80°. Winds: first part, S. E.; middle and latter part, E. Commences with hard squalls from the S. and E., and much rain. Wind heading me to S. W. by S.; headed me the same the last time I crossed the parallel—in March, 1850—being advised of it by Maury, and of course expected it, am not to be discouraged yet. Latter part, winds more easterly; heavy head sea, and dark cloudy weather.

Dec. 12. Lat. 5° 3′ N.; long. 31° 20′ W. Current per hour, 1 knot W. Barometer, 29.85; temperature of air, 80°; of water, 79½°. Winds: first part, S. E. by E.; middle part, E. S. E.; latter part, baffling. Commences with strong breezes from the east, and cloudy weather; hove to two hours, setting up rigging. Through the night, light baffling winds, and squally, with much rain; all sail set; ends strong breezes.

Dec. 13. Lat. 2° 30′ N.; long. 31° 10′ W. Current, ½ knot, W. N. W. Barometer, 29.90; temperature of air, 80°; of water, 79°. Winds: during first and middle parts, E. S. E.; latter part, S. E. Fresh breezes and firm weather. I do not know whether to call them S. E. trades or not; if so, I have had them since leaving 20° N.; weather more settled; made a sail hood on the weather bow. At 8 P. M. spoke the brig Brandywine, 26 days out from Philadelphia, bound to Pernambuco; reports light easterly winds; of course he was to the east, and had no difficulty in clearing the cape, as he crosses in this parallel every three months.

Dec. 14. Lat. 00° 5′ S.; long. 32° 5′ W. Current, ½ W. N. W. Barometer, 29.95; temperature of air, 80°; of water, 79°. Winds: during the first and middle part, E. S. E.; latter part, S. E. Strong breezes, and fine weather. I considered my passage thus far extra, and I consider myself far enough to the eastward to be safe, in order to clear the cape (19 days and 19 hours). I can see where I have lost *one* day in this passage, by not bracing sooner, and keeping to the eastward, in order to cross 20° N., according to Maury's direction; but supposing the wind would favor me, if I kept on with the wind free until I crossed the latitude of 15° N., I was obliged, as the wind still hung to the eastward, to brace up sharp, to make my mark, and have been so for the last eight days, and making a zigzag track. However, I was determined not to tack until the land compelled me, or as long as she would head S. S. W. good full.

Dec. 15. Lat. 1° 20′ S.; long. 33° 00′ W. Current per hour, ½ knot N. Barometer, 30.00; temperature of air, 80°; of water, 79°. Winds: first part, S. E. by E.; middle part, S. E.; latter part, S. E. Light breezes and fine weather; wind hanging steady for S. E., and every appearance of continuing so.

Dec. 16. Lat. 3° 24′ S.; long. 34° 00′ W. Barometer, 29.95; temperature of air, 80°; of water, 79°. Winds: during first and latter part, S. E.; middle part, S. E. by E. Light and steady winds, and fine weather. I have been looking for a strong current, but experience none of any consequence.

Dec. 17. Lat. 6° 17′ S.; long. 34° 34′ W. Barometer, 29.90; temperature of air, 80°; of water, 79°. Winds: during first and middle part, E. S. E.; latter part, S. E. by E. Moderate breeze from the E. S. E. through the night; wind seems to favor us a point; no prospect of weathering "Roccas;" fortunately, there is water enough to the leeward of it; for the Tingqua shall proceed—cannot think of tacking so long as there is room to wear—in hopes the wind will favor us through the night as heretofore. Latter part, fine weather—to the southward of "Roccas;" judged we passed about nine miles to the west of it,

but did not see it; ship heading up S. ½ W. during the night. At noon, saw the land about Point Natal and Point Anger; cannot weather it. I believe I will stand off a few hours, in order to take advantage of the breeze through the night.

Dec. 18. Lat. 7° 48′ S.; long. 34° 40′ W. Barometer, 29.90; temperature of air, 82°; of water, 79°. Winds: during first part, S. E.; middle and latter part, E. S. E. Light breezes, and pleasant; stood off shore until 10 P. M.; wind still continuing steady from the S. E.; appearance of a change to the eastward. Tacked in shore, wind dying away; at 11 P. M. wind from the E. S. E., in a squall. Continued blowing fresh throughout the day. At noon, passed in sight of Olinda; and now I consider myself clear of all dangers, with a good leading breeze, and all the *kites* out. 24 days out, and clear of Cape St. Augustine.

Dec. 19. Lat. 9° 55′ N.; long. 34° 45′ W. Barometer, 29.95; temperature of air, 82°; of water, 80°. Winds from the E. S. E. during the 24 hours; with moderate breezes, and fine weather; under all sail; sea very smooth. I do not suppose there is one instance out of a hundred, where the wind has held so steady from the S. E., as in this one—which shows the worst side of Maury's Track—which, I think, I have given a little more than a fair trial—that is, exceeded his limits somewhat; however, I have found no difficulty, and would try the same track again. I found no current of any consequence south of the line, and the wind bearing to the eastward at night, has helped me amazingly. Since leaving 5° N. the wind has held S. E. steady, which would carry me on to Cape St. Roque; and I stood on, still in hopes of a change, until, by help of winds veering by night, and a short tack, I weathered and passed about ten miles east of Olinda. 24 days out, without any trouble whatever, except what was borrowed.

Dec. 20. Lat. 12° 10′ S.; long. 35° 00′ W. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: during first and middle parts, E.; latter part, E. N. E. Commenced with light winds, and fine weather. At 3 P. M. made two sails ahead from the top-gallant yard; at 5 P. M. saw them from the deck, a ship and a barque. Ship steering S. S. E.; barque, the same course as ourselves. At 7 P. M. spoke the barque, which proved to be the Francis F. Jenness, of Portland, from Philadelphia, bound to San Francisco, 84 days out; did not understand the longitude in which she crossed the line, but she was 33 days between 10° N. and the line; suppose, of course, he must have been to the eastward. If there is any virtue in Maury's Charts, I think I have had the benefit of them. This ship left Philadelphia 4 days before the Tingqua was launched at Portsmouth. I do not know whether this is a comparison or not between the new and old route; if so, the advantage is decidedly in favor of the new one.

Dec. 21. Lat. 15° 07′ S.; long. 35° 00′ W. Barometer, 30.00. Winds: during first and middle part, E.; latter part, E. N. E. Commenced with light breeze; saw a number of vessels to the northward. At 6 P. M. wind dying away; at sunrise, saw a large ship to windward, steering S. S. W.; appeared as if her foretopmast was gone; wind inclining to the N.; clouds rising from the N. E.

Dec. 22. Lat. 17° 37′ S.; long. 36° 10′ W. Current, per hour, ½ knot S. W. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: during first part, E. S. E.; middle, E. N. E. and latter part, N. E. First part, light and baffling winds; latter part, fresh breeze, and cloudy.

Dec. 23. Lat. 20° 50′ S.; long. 37° 20′ W. Current, per hour, 1 knot S. W. Barometer, 29.90;

temperature of air, 80°; of water, 78°. Winds: during the first and latter part, N. E.; middle part, N. N. E. Commences and continues during the night with moderate breezes and squalls, with much rain. Ends squally; wind veering two points in the squall, owing, I suppose, to the Abrolhos Bank, although there is no change in the barometer or thermometer. Ends with strong breeze.

Dec. 24. Lat. 23° 51′ S.; long. 41° 00′ W. Current, per hour, *one* knot, S. W. Barometer, 29.90; temperature of air, 80°; of water, 78°. Winds: during first and latter part, N. E.; middle part N. N. E. Light winds and pleasant; all sail set; saw two fishing-boats. Ends cloudy; 30 days out, and to the southward of Rio, and only one degree to the eastward of it.

Ship Alboni (N. R. Littlefield), New York to San Francisco, fourteen days out.

Dec. 6, 1852. Lat. 21° 43′ N.; long. 37° 50′ W. Temperature of air, 78°; of water, 79°. Winds: N. E. baffling, E. S. E. First part, light; middle very light; latter, pleasant breezes.

Dec. 7. Lat. 19° N.; long. 37° 50′ W. Barometer, 29.50; temperature of air, 80°; of water, 79°. Winds: S. E., E., E. S. E.; first and middle parts, fresh and squally; latter, pleasant.

Dec. 8. Lat. 16° 20′ N.; long. 37° 58′ W. Current, 64 miles E.; temperature of air, 80°; of water, 85°. Winds: E. N. E.; fresh gales and squally. Rainbows, sundogs, wind gulls(?)—everything to make it unpleasant. I have never found such a current hereabout. I have crossed this latitude some forty or fifty times. I have often, in long. 40° near the equator, found similar currents.

Dec. 9. Lat. 14° 30′ N.; long. 34° W. Current, 1.4 miles per hour E.; temperature of air, 79°; of water. 79°. Winds: E. S. E., E. S. E., E.; fresh gales and squally. Tide-rips.

Dec. 10. Lat. 12° 24′ N.; long. 33° 10′ W. Current, 0.6 miles per hour E.; temperature of air, 79°; of water, 80°. Winds: E., fresh and unpleasant, very heavy sea from S. E.

Dec. 11. Lat. 10° 18′ N.; long. 32° 15′ W. Temperature of air, 80°; of water, 80°. Winds: E. S. E., E., E.; fresh and squally. Tide-rips; found no current.

Dec. 12. Lat. 7° 33′ N.; long. 31° 58′ W. Temperature of air, 80°; of water, 81°. Winds: E.; fresh and squally.

Dec. 13. Lat. 5° 16′ N.; long. 31° 38′ W. Temperature of air, 82° of water, 81°. Winds: E. S. E. and baffling; first part fresh and pleasant, middle and latter squally.

Dec. 14. Lat. 3° 28′ N.; long. 32° 10′ W. Temperature of air, 81°; of water, 81°. Winds: S. S. E. and baffling; light and squally.

Dec. 15. Lat. 3° N.; long. 32° W. Temperature of air, 80°; of water, 80°. Calm throughout. This day calm; with rain, thunder, and lightning.

Dec. 16. Lat. 1° 54′ N.; long. 32° 10′ W. Temperature of air, 79°; of water, 79°. Winds: calm, S. E., S. E. First part calm, with thick fog; middle and latter, light breezes.

Dec. 17. Lat. 0° 27′ S.; long. 32° 25′ W. Temperature of air, 80°; of water. 80°. Winds: S. E. light and pleasant.

Dec. 18. Lat. 3° 03′ S.; long. 32° 38′ W. Temperature of air, 80°; of water, 80°. Winds: S. E. by E., S. E., S. E. All this day, light and pleasant.

Dec. 19. Lat. 5° 43′ S.; long. 32° 38′ W. Temperature of air, 80°; of water, 80°. Winds: S. E. by E., S. E., S. E. Light and pleasant.

Dec. 20. Lat. 8° 43′ S.; long. 33° 41′ W. Temperature of air, 80°; of water, 80°. Winds: S. E. This day pleasant; I found not the least difficulty in clearing the land.

Jan. 15, 1853. Lat. 50° 11′ S.; long. 64° 10′ W. Temperature of air, 48°; of water, 48°. Winds: south, calm, west. First part, light; latter part, with rain; saw patches of kelp.

Jan. 16. Lat. 42° 21′ S.; long. 63° 50′ W. Temperature of air, 46°; water, 48°. Winds: S. W. by W., S. S. W., S. W. First part, fresh; middle, fresh gales; latter, fresh breezes and pleasant. Large schools of whales, two or three hundred or more.

Jan. 17. Lat. 52° 40′ S.; long. 64° 12′ W. Temperature of air, 47°; water, 46°. Winds: S. S. W., west, calm. First part, light; middle, very light, with rain squalls. The next passage I make to Cape Horn, I will, if possible, keep much nearer the land. If I had been two degrees nearer the land, I have no doubt but what I should have shortened my passage at least five days.

Ship Samuel Russell (J. Limeburner), 19 days to the line from New York, ten days out.

Dec. 15, 1851. Lat. 19° 1′ N.; long. 43° 29′ W. Wind: E. S. E.; fine and pleasant.

Dec. 16. Lat. 16° 13′ N.; long. 42° 2′ W. Winds: E., E. N. E.; baffling winds and squally weather.

Dec. 17. Lat. 13° 47′ N.; long. 39° 48′ W. Wind: E. S. E.; strong breezes.

Dec. 18. Lat. 11° 36′ N.; long. 37° 25′ W. Wind: E. N. E.; strong breezes and rainy.

Dec. 19. Lat. 8° 59′ N.; long. 34° 47′ W. Wind: E. N. E.; very fine.

Dec. 20. Lat. 6° 27′ N.; long. 32° 31′ W. Wind: E. N. E.; fine breezes and squally weather.

Dec. 21. Lat. 4° 30′ N.; long. 30° 38′ W. Winds: E. N. E., E. N. E., east; moderate and pleasant.

Dec. 22. Lat. 2° 27′ N.; long. 30° 30′ W. Wind: east; light airs.

Dec. 23. Lat. 0° 00′. long. 30° 18′ W. Wind: S. E.; moderate breezes; crossed the equator in 18 days and 20 hours from New York.

Dec. 24. Lat. 3° 32′ S.; long. 32° 18′ W. Wind: S. E. by S.; fine breezes. At 3, passed Fernando de Noronha.

Dec. 25. Lat. 7° 9′ S.; long. 32° 55′ W. Wind: S. E.; strong breezes, with passing squalls of rain.

Dec. 26. Lat. 11° 14′ S.; long. 33° 12′ W. Wind: E. S. E.; fine breezes and pleasant.

Barque Hazard (Andrew Barstow), New York to Rio, thirteen days out.

Dec. 16, 1853. Lat. 20° 11′ N.; long. 39° 51′ W. Barometer, 30.00. Winds: E. S. E., E., E. N. E.; fresh breezes and squalls; ends hazy.

Dec. 17. Lat. 16° 54′; long. 38° 31′ W. Barometer, 30.00. Winds: E. N. E., E. S. E., E.; fresh breezes and squalls; ends hazy.

Dec. 18. Lat. 13° 55′ N.; long. 37° 12′ W. Barometer, 29.9. Winds: E., E., E.; squally from E. S. E. to E. N. E.

Dec. 19. Lat. 11° 14′ N.; long. 35° 48′ W. Barometer, 30.00. Winds: E., E., E.; moderate weather.

Dec. 20. Lat. 8° 31′ N.; long. 34° 49′ W. Barometer, 29.9. Winds: E., E., E.; first moderate, middle and latter fresh.

Dec. 21. Lat. 6° 03′; long. 32° 54′ W. Barometer, 29.9. Winds: E., E., E. N. E.; fresh breezes and pleasant weather.

Dec. 22. Lat. 4° 37′ N.; long. 31° 46′ W. Barometer, 29.9. Winds: E. N. E., E., E. S. E.; a heavy S. E. squall; middle and latter, squally.

Dec. 23. Lat. 3° 11′ N.; long. 31° 47′ W. Barometer, 22.9. Winds: E. S. E., E. S. E., S. E.; light airs and cloudy.

Dec. 24. Lat. 1° 14′ N.; long. 31° 35′ W. Barometer, 29.9. Winds: E., E., S. E.; middle, heavy; E. N. E., squalls; thunder, lightning, and rain.

Dec. 25. Lat. 0° 47′ S.; long. 31° 41′ W. Barometer, 29.9. Winds: E., E. N. E., E.; squalls with thunder, lightning, and rain.

Dec. 26. Lat. 2° 20′ S.; long. 31° 50′ W. Barometer, 29.9. Current, per hour, 1 knot, W. Winds: E., E., S. E.; for 20 hours squalls from N. E., E., to S. S. E.; thunder, lightning, and rain.

Dec. 27. Lat. 4° 20′ S.; long. 32° 30′ W. Barometer, 29.9. Winds: S. E., S. E., S. S. E.; squally, with much lightning; tacked several times.

Dec. 28. Lat. 6° 36′ S.; long. 32° 32′ W. Barometer, 29.9. Winds: S. E., S. E., E. N. E.; squally, with lightning.

Dec. 29. Lat. 9° 50′ S.; long. 33° 18′ W. Barometer, 29.9. Winds: S. E., S. E., E. S. E.; fresh breezes, and pleasant.

New Orleans, *March* 22, 1853.

Sir: Having taken passage in the barque Hazard, of Salem, George M. Pollard, master, for Rio de Janeiro and back to New Orleans, Captain P. requested me to keep an abstract journal, which he received from your agent with a set of Wind and Current Charts, having engaged that it should be sent you on his return to the United States.

I now take the liberty of transmitting it to you, with the hope that you may find something therein to repay the examination. I would also take the liberty of making some remarks.

It was Captain Pollard's intention to follow in the track to the line that you recommended, as nearly as possible; but strong southerly winds, soon after leaving New York, drove the barque to the eastward, and when the track was regained, it was impossible to cross the line, as advised, without wasting time in beating to eastward in the doldrums. Having myself, in 1818, in ship Commerce, of Salem, about same season, crossed the line in about 34°; and, although a wooden-bottomed ship, passed Pernambuco in nine days from the line, after making the land ten or twelve miles to leeward of St. Roque; I advised Captain

Pollard to stand boldly across in 34°, the Hazard being a fast vessel. The result proved as was expected, passing Pernambuco in only four and three-fourth days from the equator, in long. 34°, notwithstanding falling twenty miles to leeward of St. Roque.

From these examples, and the information gathered from traders between Maranham and Rio de Janeiro, I should not hesitate crossing the line in 36°, even in a good sailing vessel, feeling confident of beating round St. Roque by making short tacks on soundings which are very regular, and may be trusted to. Off soundings, the current sets very strongly to westward.

On my arrival at Bahia, in December, 1818, I found that the passage from the latitude of Cape Verdes was from 10 to 20 days shorter than any other vessel's. The conclusion I then came to, was that the best track was 8 to 10° west of the Cape Verdes, passing the equator from 28° and 32° according to season. This is now proved beyond a doubt by your Charts, which are of incalculable benefit to all navigators.

I would suggest more particular inquiry about the monsoon, if I may so call it, that prevails along the Brazil coast from N. E. to N. N. E. during January and February, sometimes in December, which makes it very difficult to reach the equator from Rio. Dull vessels are often thirty days or more to Bahia and Pernambuco from Rio, and should they fall to leeward of St. Augustine, bound north, find it almost impossible to beat around, the currents set so strong to S. W. During the winter months, the prevailing winds are southerly and S. W., but not so steady and constant as the N. E. in summer.

I have added to the Journal an abstract of the Hazard's passage from New York to Rio, in 1851, in thirty-one days, the shortest ever made by a merchant vessel loaded with a full cargo, or probably than any; also, some memorandums of her six passages from Boston and New York to the equator, showing an average of only twenty-six and a half days; her tracks being always those which you recommend, and they are very conclusive evidence of the correctness of your advice, if any further evidence was wanting of its superiority over the old ones.

I remain very respectfully,

Your obedient and obliged servant,

JOHN GARDNER.

LIEUTENANT MAURY, U. S. N.

National Observatory, Washington, D. C.

I have investigated the subject of the so-called monsoons along the coast of Brazil.—See Pilot Chart of the Coast of Brazil. I find none upon a scale for that chart of 2° of lat. by 1° of long. During some seasons of the year, certain winds are more prevalent than at others, as winds with northing in them, in *our* winter and spring; but these winds do not partake of the characteristics of monsoons.

Further, in reply to this very clever letter, I may remark, that a vessel crossing the line as far west as 36°, may clear St. Roque in three days; but on the average it will take about a week.

Ship Tuscany (Thomas Mayo), New York to San Francisco, twenty-two days out.

Dec. 20, 1853. Lat. 21° 58′ N.; long. 34° 35′ W. Barometer, 29.09; temperature of air, 75°; of water, 74°. Winds: North, N. by E., N. E.; good breezes; squalls of wind and rain, with a heavy sea from N. N. W. Barometer frequently fluctuating a tenth in the course of two hours.

Dec. 21. Lat. 19° 30′; long. 34° 15′. Barometer, 29.09; temperature of air, 74°; of water, 76°. Winds: E. N. E., E. by N., E. Throughout good breezes, attended with frequent squalls of rain. At 10 hours 30 min. A. M. observed tide rips, with every indication of a strong current, although we have not experienced any. A confused sea from north.

Dec. 22. Lat. 16° 58′ N.; long. 33° 40′ W. Barometer, 29.09; temperature of air, 74°; of water, 76° Winds: E. by S., E., E. All of these twenty-four hours, fresh breezes; first and middle parts, squally, with considerable sea from N. N. E.; observed tide rips several times during the day.

Dec. 23. Lat. 14° 25′ N.; long. 33° 15′ W. Current, S. W. by W., three miles throughout. Barometer, 30.00; temperature of air, 76°; of water 74°. Winds: E. by S., E. S. E., E. Fine pleasant weather, with steady trades.

Dec. 24. Lat. 12° 00′ N.; long. 32° 44′ W. Barometer, 29.09; temperature of air, 76°; of water, 75°. Winds: E., E. by N., E. First part, fresh breezes and pleasant, middle and latter parts, moderate and cloudy.

Dec. 25. Lat. 9° 50′ N.; long. 32° 17′ W. Barometer, 29.08; temperature of air, 76°; of water, 78°. Winds: E., E. by N., E. Throughout, moderate breezes, with hazy weather.

Dec. 26. Lat. 7° 25′ N.; long. 31° 18′ W. Barometer, 29.07; temperature of air, 76°; of water, 78°. Winds: E. by N., E. N. E., E. by N. Moderate breezes, with hazy weather.

Dec. 27. Lat. 5° 52′ N.; long. 30° 30′ W. Current, W., half knot per hour. Barometer, 29.07; temperature of air, 78°; of water 76°. Winds: E. N. E., E., E. S. E. First part, moderate breezes as per column; middle and latter parts, squally, raining in torrents.

Dec. 28. Lat. 4° 46′ N.; long. 30° 12′ W. Current, N. W., half knot per hour. Barometer, 29.06; temperature of air, 78°; of water, 77°. Winds: S. E. to S., S. E. to S. W., calm. Throughout these twenty-four hours, light baffling winds from S. E. to S. W., with much rain, thunder, and lightning.

Dec. 29. Lat. 4° 35′ N.; long. 29° 57′ W. Current, N. W., half knot per hour. Barometer, 29.07; temperature of air, 79°; of water, 78°. Winds: calm, E. to S., E. N. E. to S. W. Squally throughout, with rain, thunder, and lightning, with a confused sea from S. S. E.

Dec. 30. Lat. 4° 10′ N.; long. 29° 52′ W. Current, W., half knot per hour. Barometer, 29.06; temperature of air, 79°; of water, 80°. Winds: E. to S., calm. Calm throughout, light baffling winds with rain. Sea from S. S. E. Exchanged signals with British brig Corsair, standing to the northward and eastward.

Dec. 31. Lat. 3° 32′ N.; long. 30° 15′ W. Current, W., half knot per hour. Barometer, 29.07; temperature of air, 80°; of water, 80°. Winds: calm, S. S. E., S. E. by S. Squally, with much rain, thunder, and lightning, from S. W.

Jan. 1, 1853. Lat. 3° 02′ N.; long. 30° 47′ W. Current, W. N. W., half knot per hour. Barometer, 29.06; temperature of air, 78°; of water, 79°. Winds: S. E. by S., S. S. E., S. S. E. Light baffling airs from S. E. to S., with much sea from S. S. E. Rain, &c.

Jan. 2. Lat. 2° 42′ D. R.; long. 31° 17′ W. Barometer, 29.07; temperature of air, 79°; of water, 78°. Winds: S. E. by S., S. S. E., S. E. by S. Light airs from S. E. to S., with frequent rain squalls. Lightning from westward.

Jan. 3. Lat. 2° 02′ N.; long. 31° 42′ W. Current, for the last 48 hours, 35 miles W. N. W. Barometer 29.06; temperature of air, 78°; of water, 80°. Winds: S. S. E., S., S. by E. First part, moderate breezes from S. S. E.; at 7 P. M. tacked to the eastward. Ends with light airs. Sea from the northward.

Jan. 4. Lat. 2° 16′ N.; long. 31° 12′ W. Current, W. N. W., 20 miles. Barometer, 29.07; temperature of air, 77°; of water, 79°. Winds: S., S. S. E., S. E. by S. Throughout, light breezes, with a very irregular sea from all points of the compass.

Jan. 5. Lat. 1° 48′ N.; long. 31° 56′ W. Current, W. N. W., 15 miles. Barometer, 29.08; temperature of air, 79; of water 80°. Winds: S. E. by S., S. S. E., S. by E. Light baffling airs at 9 P. M. I find the current to run at an average rate of 0.7 per hour, for the last five days set W. N. W., true.

Jan. 6. Lat. 2° 12′ N.; long. 31° 16′ W. Current, W. N. W., fifteen miles; barometer, 29.07; temperature of air, 80°; of water, 80°. Winds: S. by E., S. S. E., S. E. by S.; light breezes from S. by E. to S. E. by S.; ship moving slowly against a head sea and making much drift.

Jan. 7. Lat. 1° 46′ N.; long. 31° 37′ W. Current, 0.7 knot per hour. Barometer, 22.07; temperature of air, 79°; water, 82°. Winds: S. S. E., south, S. by W.; light airs, with a high, irregular sea from S. S. E.; latter part calm, bad sea on.

Jan. 8. Lat. 1° 18′ N.; long. 31° 10′ W. Current, 0.7 knot per hour. Barometer, 29.06; temperature of air, 81°; of water, 81°. Winds: calm, S. E., S. E.; first part, calm. At 2 hours 30 min. P. M. wind sprung up from S. E., attended with frequent showers of rain.

Jan. 9. Lat. 0° 10′ N.; long. 31° 47′ W. Current, 0.6 knot per hour. Barometer, 29.07; temperature of air, 83°; of water 82°. Winds: S. E. by E., S. E. by E.; E. S. E.; steady breezes; every indication of S. E. trades.

Jan. 10. Lat. 1° 30′ S.; long. 32° 17′ W. Current, 0.4 knot per hour. Barometer, 29.08; temperature of air, 83°; of water, 82°. Winds: S. E. by E., S. E., S. S. E.; moderate breezes; stood to the eastward 4 hours.

Jan. 11. Lat. 3° 34′ S.; long. 32° 46′ W. Current, 0.6 knot per hour. Barometer, 29.07; temperature of air, 82°; water, 81°. Winds: S. E. by S., S. E., E. S. E. Moderate breezes, and a smooth sea. At 11 hours 30 min. A. M., saw the island Fernando de Noronha.

Jan. 12. Lat. 4° 53′ S.; long. 33° 37′ W. Current, 0.9 knot per hour. Barometer, 29.08; temperature of air, 83°; of water, 81°. Winds: S. E., S. E., S. S. E.; moderate winds, and pleasant; strong westerly set.

Jan. 13. Lat. 6° 36′ S.; long. 33° 58′ W. Current, 0.5 knot per hour. Barometer, 59.07; temperature of air, 83°; of water, 82°. Winds: S. E., E. S. E., E. S. E.; steady breezes, and pleasant.

Jan. 14. Lat. 8° 21′ S.; long. 34° 24′ W. Current, slight, N. W. Barometer, 29.08; temperature of air, 82°; of water, 81°. Winds: E. S. E., E., E. S. E.; steady breezes, and pleasant. I have found no difficulty in passing St. Augustine, although I crossed the equator in 31° 53′; and this in a vessel that seldom goes over seven knots within seven points of the wind. In future, I shall not think of crossing east of 30°.

Clipper Ship Winged Racer (Wm. Homans), New York to San Francisco, fourteen days out.

Dec. 26, 1852. Lat. 21° 20′ N.; long. 34° 55′ W. Barometer, 29.7; temperature of air, 76°; of water, 76°. Wind: E. S. E.

Dec. 27. Lat. 17° 53′; long. 33° 37′. Barometer, 29.7; temperature of air, 77°; of water, 76°. Wind: east.

Dec. 28. Lat. 14° 14′ N.; long. 31° 48′ W. Barometer, 29.70; temperature of air, 76°; of water, 78°. Wind: E. by N.

Dec. 29. Lat. 10° 14′ N.; long. 30° W. Barometer, 29.5; temperature of air, 79°; of water, 79°. Wind: E. by N.

Dec. 30. Lat. 6° 5′ N.; long. 28° 35′ W. Barometer, 29.5; temperature of air, 81°; of water, 80°; Wind: E. by N.

Dec. 31. Lat. 3° 50′ N.; long. 28° 1′ W. Barometer, 29.5; temperature of air, 82°; of water, 80°. Winds: first part, E. by N.; middle part variable, from N. E. to S. E.; latter part variable.

Jan. 1. 1853. Lat. 3° N.; long. 28° 19′ W. Barometer, 29.5; temperature of air, 82°; of water, 80°. Winds: first and middle part, N. to E.; latter part, S. E.

Jan. 2. Lat. 1° 55′ N.; long. 29° 44′ W. Current, W. N. W., 30 miles; barometer, 29.5; temperature of air, 82°; water, 80°. Wind: variable.

Jan. 3. Lat. 0° 24′ S.; long. 31° 32′ W. Current, W. N. W., 20 miles; barometer, 29.5; temperature, of air, 83°; of water, 79°. Winds: first part, S. S. E.; middle and latter part, S. E. At 8 A. M. crossed the equator in long. 31° 16′ W., 21 days and 21 hours from New York. Distance sailed, by log, 4,086 miles; by Maury's calculations, 4,115 miles.

Jan. 4. Lat. 3° 11′ S.; long. 33° 4′ W. Barometer, 29.5; temperature of air, 83°; of water, 79°. Winds: first part, S. E.; middle part, S. E. by S.; latter part, S. E.

Jan. 5. Lat. 6° 38′ S.; long. 33° 52′ W. Barometer, 29.5; temperature of air, 83°; of water, 79°. Winds: first part, S. E.; middle and latter part, S. E. by E.

New York to Rio.—JANUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From 40° 27′N.	74° 00′to										
40 27	70 00	E.	182	6.2	193	2.0	6.0	5.0	87.0	2.1	97
38 52	65 00	E. S. E.	249	7.4	266	2.4	5.6	5.6	86.4	0.8	118
38 52	60 00 *d*	E.	243	6.7	249	0.9	3.6	*w* 11.7	83.8	3.4	113
37 14	55 00	E. S. E.	255	7.5	274	2.4	3.2	*w* 8.8	85.6	0.0	128
35 35	50 00	E. S. E.	260	8.3	283	3.0	7.0	8.0	82.0	4.5	105
35 00	48 17 *d*	E. S. E.	92	11.4	103	4.4	6.6	*w* 13.2	75.8	0.0	91
30 00	45 49	S. S. E.	324	12.1	362	1.9	15.2	*w* 19.0	63.9	10.0	54
29 44	45 00	E. S. E.	42	25.7	53	8.4	*w* 25.2	11.8	49.8	4.2	24
25 20	40 00	S. E.	347	13.6	425	3.3	*w* 16.4	8.2	72.1	1.6	61
25 00	39 38 *d*	S. E.	34	28.0	43	13.2	8.7	*w* 11.0	67.0	3.3	88
20 00	37 16	S. S. E.	324	6.4	344	2.5	5.5	5.5	87.5	0.0	80
15 00	35 00	S. S. E.	324	7.7	348	0.0	*w* 15.8	10.5	73.7	0.0	19
10 00	32 53	S. S. E.	324	0.4	325	0.0	*w* 3.0	0.0	97.0	0.0	33
5 00	30 48 *d*	S. S. E.	324	1.6	329	0.0	*w* 8.0	0.0	92.0	0.0	25
Equator	30 48	S.	300	0.7	302	0.0	*w* 6.6	0.0	93.4	0.0	88
1 00′S.	31 13	S. S. W.	65	3.7	67	0.0	*w* 15.0	0.0	85.0	0.3	294
2 54	32 00	S. S. W.	123	6.1	130	0.0	*w* 23.9	0.0	76.1	0.0	46
5 00	32 52 *d*	S. S. W.	137	5.8	145	0.0	*w* 28.6	0.0	71.4	0.0	21
5 08	33 00	S. W.	12	0.0	12	0.0	0.0	0.0	100.0	0.0	29
7 00	34 00	S. S. W. ½ W.	136	5.1	143	0.0	*w* 14.4	0.0	85.5	0.0	28
9 00	34 50	S. S. W.	130	5.3	137	2.9	2.9	0.0	97.1	8.0	34

Shortest distance to the equator by this route, 3,640 miles. Average distance to be sailed on account of adverse winds, 3,899 miles. The Surprise, in January, 1851, accomplished it in 24 days, and 3,852 miles per log.

The courses from 35° N. to 30° N., and from 7° S. to 9° S., run through a part of the ocean that is liable to calms. In the adjacent wind-roses, to the east of these (see Pilot Charts), there is less liability to calms. From New York to the parallel of 25° N., in this month, the south is generally the windward side. Thence to the line it is to leeward. Prefer, therefore, in this month, to cross 25° N. to the E. of 40°, and 7° S. to the E. of 34° W. longitude.

Ship John Bertram (F. Lendholm), Boston to San Francisco, sixteen days out.

December 28, 1851. Lat. 16° 16′ N.; long. 43° 15′ W. Current, three-quarters of a mile per hour, S. E. Barometer, 30.42; thermometer, not observed. Winds: E. S. E., E. by N. to S. E., S. E. by S. First part, wind light, and baffling; a strong ripple on the water like a current. Barometer, rising and falling rapidly through the twenty-four hours; in the evening, heavy clouds rising from the W. S. W., with sharp lightning; clouds rising all around the horizon, and settling where they started from; latter

part, winds light and baffling, weather pleasant. Barometer falling to 30.35, which is not an indication of the N. E. trades.

Dec. 29. Lat. 16° 51′ N.; long. 41° 30′ W. Current, during the twenty-four hours, twenty-two miles, N. E. Barometer, 30.30. Winds: S. E. by S., S. S. E., and S. by E.; light breezes, and pleasant weather; middle part, light air and a short chopping sea, running from the E. N. E., by which I judge the trades are not far off. Latter part, light airs, and cloudy, hazy weather.

Dec. 30. Lat. 16° 47′ N.; long. 40° 00′ W. Current, during twenty-four hours, nine miles north; barometer, 30.30. Winds: S. by E., variable and calm, S. by W. to S. by E.; light baffling winds and hazy weather; middle part, light variable airs and calm, with heavy thunder and sharp flashes of lightning; morning pleasant, with light airs from the south; latter part, gentle breezes and appearances of squally weather.

Dec. 31. Lat. 16° 13′ N.; long. 38° 39′ W. Barometer, 30.25. Winds: S. S. W., S. S. W., and calm; first part, light breezes and squally weather; middle part, light airs and cloudy; latter part, calm with rainy weather.

Jan. 1, 1852. Lat. 15° 11′ N.; long. 33° 13′ W. Current, during twenty-four hours, thirty-nine miles, E. N. E.; barometer, 30.42. Winds: variable airs, calm, and E. S. E.; first and middle part, light variable airs and calms, with heavy showers of rain; latter part, light breezes and squally weather.

Jan. 2. Lat. 11° 59′ N.; long. 38° 13′ W. Barometer, 30.40. Winds: S. E. by E.; first part, moderate breezes and heavy weather; strong rips on the water at times, again very smooth, as though there might be current, but found none; middle and latter part, fresh and moderate breezes with hazy weather.

Jan. 3. Lat. 10° 27′ N.; long. 36° 55′ W. Barometer, 30.39. Winds: E. S. E., east, and E. N. E.; first part, light breezes and hazy weather; middle part, moderate breezes and hazy; first appearance of dew in the night; latter part, fine breezes with pleasant weather and passing clouds. I suppose this to be the first of the N. E. trades; hope I shall not be disappointed this time, as I was eight days ago, in lat. 21° N.

Jan. 4. Lat. 7° 49′ N.; long. 35° 07′ W. Barometer, 30.37. Winds: E. by N., E. by N., and east; during these twenty-four hours, fine breezes and passing clouds; quite a heavy dew falling, second night.

Jan. 5. Lat. 6° 09′ N.; long. 32° 22′ W. Current, during twenty-four hours, twenty-eight miles east; barometer, 30.40. Winds: E. by N., E. N. E., E. N. E.; first and middle part, moderate breezes and pleasant weather; latter part, brisk trades and passing clouds.

N. B. I have experienced this easterly current two voyages previous to this, at about the same season, and nearly in the same place; perhaps one, or one and a half degree further east.

Jan. 6. Lat. 3° 30′ N.; long. 29° 35′ W. Current, during 24 hours, 27 miles, N. N E. Winds: E. N. E., E. by N., and E. N. E. throughout these 24 hours; brisk breeze, and passing clouds.

Jan. 6. Lat. 1° 17′ N.; long. 29° 04′ W. Barometer, 30.38. Winds: E. S. E., E. by S., E. S. E.; first part, light wind, and pleasant; middle part, moderate breezes with passing squalls of rain; latter part, light breeze, and pleasant.

Jan. 8. Lat. 00° 47′ S.; long. 30° 02′ W. Current, N., 17 miles. Barometer, 30.38. Winds: S. E.,

S. E. by S., S. S. E.; first part, light, baffling wind, and squally appearance. At 3 P. M. made St. Paul's Rock, bearing S. W. ¾ W.; strong ripplings on the water; middle part, moderate breeze and passing clouds. At 4h. 30m. P. M. the ship was on the equator, in long. 29° 40′ W.; 27 days and 16 hours from Boston.

Jan. 9. Lat. 3° 01′ S.; long. 31° 01′ W. Current, during 24 hours, 9 miles, W. Barometer, 30.37. Winds: S. E. by S., S. E. by S., and S. S. E. Throughout light.

Jan. 10. Lat. 5° 50′ S.; long. 32° 14′ W. Current, 13 miles, S. W. ½ W. Winds: S. E. by S., S. E., S. E.; first part, light breeze, and pleasant. At 2 P. M. spoke the English schooner Harriet, 35 days out from St. John, N. F.; bound to Pernambuco; reported having crossed the equator in 25° 30′ W., and had no calm; reported also having taken the N. E. trade in lat. of 22° N., and had fresh trades; his passage being only five days longer than mine. I had great curiosity to know how he had been steering with so much difference in the two vessels' sailing; so much so, that, from the time I could just see him from the deck ahead, until I lost sight of him astern, did not exceed eight hours. I sent my first officer on board with letters to be forwarded to the United States; also to gain some information about his passage; the track on his chart showed that he had kept well to the eastward, and had good runs, especially from 22° N., when he first took the trades. [The passage from St. John's to the line ought to be several days shorter than from New York.] Middle and latter part, moderate trade, and pleasant.

Captain Curwen, of the Golden West, to Lieut. Maury.

SAN FRANCISCO, *April* 29, 1853.

DEAR SIR: I herewith inclose abstract log of ship Golden West, from Boston to San Francisco. You will perceive that I took the N. E. trades on the Atlantic, in latitude 30° N., and longitude 40° W.; and that I had them throughout from E. to S. E.; never to northward of east. Carried them to latitude 00° 53′ N.; longitude, 33° 37′ W., when wind hauled to S. S. E., and obliged me to tack, 21 days out. From this time, until January 10 (28 days out), when I crossed the equator, experienced light baffling airs and calms, with strong N. W. current most of the time.

Although mine was an unusually bad chance, still, I think that 28 days to the equator would be considered a fair passage by the old route. You will also notice, that from latitude 25° to 22° S. on the Pacific, where I should have had S. E. trades—had very light northerly airs and calms—have experienced strong westerly currents from latitude 20° S. to 20° W., in the Pacific.

I shall continue keeping an abstract, and will forward the same to you from time to time.

"*Ship Golden West* (Samuel R. Curwen), fourteen days out.

Dec. 28, 1853. Lat. 19° 48′ N.; long. 38° 27′ W. Barometer, 29.90; temperature of air, 80°; of water,* 78°. Winds: E. by S., to S. E. First and middle parts, brisk trades, and squally with rain; latter part, moderate.

Dec. 29. Lat. 15° 47′ N.; long. 38° 20′ W. Barometer, 30.10; temperature of air, 78°; of water,*

* 22 feet below the surface.

78°. Winds: E. S. E., E. by S., S. E. by E. First part, moderate and pleasant; middle and latter parts, brisk breezes and squally, with rain. No gulf-weed seen to-day. Great numbers of flying-fish.

Dec. 30. Lat. 11° 40′ N.; long. 37° 23′ W. Barometer, 30.00; temperature of air, 74°; of water, 76°. Winds: E. by S. to S. E. by E. Brisk trades and passing clouds; squally at times.

Dec. 31. Lat. 7° 20′ N.; long. 35° 28′ W. Current, N. 29° E., 1½ knots per hour. Barometer, 29.90; temperature of air, 78°. Winds: from E. by S. to S. E. by E. throughout the day. Strong trades and cloudy; light showers occasionally; going from 10½ to 11½ knots. Distance per log, 262 miles.

Jan. 1, 1854. Lat. 5° 08′ N.; long. 34° 01′ W. Current, N. 29° E., 1½ knots per hour. Barometer, 30.00; temperature of air, 77°; of water (22 feet below surface), 79°. Winds: E. S. E., E. S. E. to S. S. E., E. Brisk breezes, and squally appearances; night squally and baffling, with rain; ends pleasant, with moderate breezes. Distance per log, 211 miles.

Jan. 2. Lat. 2° 33′ N.; long. 32° 56′ W. Barometer, 29.90; temperature of air, 74°. Winds: E. S. E., S. S. E., S. S. E. Commences moderate and hazy; throughout the middle and latter parts squally, with heavy rain; much thunder and lightning. Distance per log, 173 miles.

Jan. 3. Lat. 00° 53′ N.; long. 33° 37′ W. Barometer, 22.90. Winds: S. E. by E., S. E., S. S. E. to S. E. First part squally, with thick rainy weather. At 4 P. M. clear and pleasant; midnight squally, with much rain. At 8 A. M., wind S. S. E., tacked to the eastward. Ends moderate and pleasant. Distance per log, 171 miles.

Jan. 4. Lat. 00° 20′ N.; long. 34° 16′ W. Barometer, 29.90; temperature of air, 88°. Winds: S. E., E. to S. E., S. S. E. First and latter part, light winds and pleasant; middle part, squally. At 7 P. M. tacked to the southward 64 miles. Current setting N. 76° W. Distance per log, 137 miles.

Jan. 5. Lat. 1° 18′ N.; long. 32° 55′ W. Barometer, 29.90; temperature of air 81°. Winds: S. S. E., S. by E., to S. E. by S. Moderate and hazy throughout. At 5 P. M. tacked to the eastward. Distance per log, 178 miles.

Jan. 6. Lat. 3° 20′ N.; long. 30° 51′ W. Barometer, 29.90; temperature of air, 84°. Winds: S. E. to S. S. E. Moderate throughout, with passing clouds. *Standing to eastward* 41 miles. Current, setting N. 46° W. Distance per log, 171 miles.

Jan. 7. Lat. 1° 52′ N.; long. 29° 03′ W. Barometer, 30.00; temperature of air, 74°; of water (22 feet below surface), 79°. Winds: S. S. E., N. E. to east, E. N. E. First part, light airs and calm; night, squally; much rain, thunder, and lightning; latter part, light airs and cloudy. No observation. Allow the same current as yesterday. Heavy swell from N. E. Tacked to the southward at 6 P. M. Distance per log, 133 miles.

Jan. 8. Lat. 2° 06′ N.; long. 30° 25′ W. Barometer, 30.00; temperature of air, 88°. Winds: S. E. to S. by E. Calm at intervals. Very heavy swell from E. N. E. A two-knot current setting N. N. W. Ship heading easterly. Distance per log, 71 miles.

Jan. 9. Lat. 1° 36′ N.; long. 30° 08′ W. Currents, N. 29° W., one and a half knot per hour. Barometer, 30.00; temperature of air, 77°: of water (22 feet below surface), 80°. Winds: S. to S. S. W., S. to

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S. S. W., S. E. by E. Light airs throughout, with passing showers. At 2 P. M. tacked to the eastward, and at 4 A. M. to the southward and westward. Distance per log, 122 miles.

Jan. 10. Lat. 00° 46′ S.; long. 32° 02′ W. Barometer, 29.90; temperature of air, 85°. Winds: S. and S. by E., S. and S. by E., S. S. E., and S. E. by S. First and middle parts, gentle breezes and passing clouds; latter part, brisk wind. No current. Distance per log, 182 miles.

Clipper Barque Storm (J. J. Roberts), from San Francisco, ten days out.

Dec. 31. Lat. 21° 41′ N.; long. 39° 25′ W. Barometer, 30.19; temperature of air, 76°; of water, 74°. Winds: E. S. E., E. by S., E. by S. Heavy weather and high seas. Lost fore-topgallant-mast; shipping whole seas over the bows.

Jan. 1, 1853. Lat. 17° 58′ N.; long. 38° 13′ W. Barometer, 30.20; temperature of air, 78°; of water, 75°. Winds: E. by. S. Weather, the same as yesterday.

Jan. 2. Lat. 14° 20′ N.; long. 37° 00′ W. Barometer, 30.10; temperature of air, 78°; of water, 77°. Winds: E. S. E., E. S. E., E. by S. Fresh breezes and fine weather.

Jan. 3. Lat. 10° 55′ N.; long. 35° 27′ W. Barometer, 30.15; temperature of air, 78°; of water, 77°. Winds: E. by S. Heavy weather and frequent squalls. For the last three days, I notice the barometer falls during the day, and towards night rises again without any material change in the weather.

Jan. 4. Lat. 7° 06′; long. 33° 42′ W. Barometer, 29.95; temperature of air, 80°; of water, 79°. Winds: E. by S., E. by S., E. S. E.; first and middle parts, heavy weather and squally—barometer very changeable; latter part, more moderate.

Jan. 5. Lat. 3° 26′ N.; long. 33° 16′ W. Barometer, 29.90; temperature of air, 80°; of water, 80°. Winds: E. S. E., E. S. E., S. E.; first and middle parts, moderate winds and rainy; latter part, rain and calms; three inches of rain fell in an hour.

Jan. 6. Lat. 2° 24′ N.; long. 34° 14′ W. Barometer, 29.94; temperature of air, 80°; of water, 80°. Winds: calm, S. S. E., S. S. E., S. S. E.; first part, fine and calm; middle, light airs; latter, light breeze. The foretopmast trestle-trees broke short off, and let the mast down by the run.

Jan. 7. Lat. 1° 10′ N.; long. 35° 16′ W. Barometer, 29.98; temperature of air, 80°; of water, 80°. Winds: first and middle parts, light and baffling to south, and calms; latter part, S. E. Fine weather and light airs. Looks rather dubious about clearing Cape St. Roque; however, I shall stand on, and trust to luck. [That's right.] It is my own fault if I fall to leeward, and get jammed, for I might easily have made more easting by sailing close-hauled.

Jan. 8. Lat. 00° 15′ S.; long. 35° 33′ W. Barometer, 30.05; temperature of air, 82°; of water, 80°. Winds: S. E. by S., E., S. E.; first part, light breeze. At 5 P. M. a heavy squall from E. N. E., carried away the larboard cathead, from the strain on the jib-guys, and wrung the bowsprit head and cap badly. All the trestle-trees, fore and aft, have given away, owing to bad material, and being too light, and I am obliged to be easier with her than I should otherwise have been. Crossed the line in 17 days and 16 hours, from Sandy Hook. At 10 A. M. took the trades at S. E. light.

Jan. 9. Lat. 2° 14′ S.; long. 36° 26′ W. Current, ½ knot per hour, W. Barometer, 30.00; temperature of air, 82°; of water, 80°. Wind: S. E. Fine weather, and light winds; observed westerly current for the first time.

Jan. 10. Lat. 3° 23′ S.; long. 36° 29′ W. No current. Barometer, 29.90; temperature of air, 81°; of water, 79°. Winds: S. E., E. S. E., S. E. by E. Fine weather, and moderate breezes.

Jan. 11. Lat. 3° 14′ S.; long. 36° 08′ W. Current, 1 knot per hour, W. Barometer, 29.93; temperature of air, 82°; of water, 79°. Winds: E. S. E., E. S. E., S. E. by E. First part, fresh breeze, and heavy S. E. swell—tacked to N. E., Point Tubarao bearing south, 35 miles distant, at 8 P. M. Latter part fine.

Jan. 12. Lat. 1° 25′ S.; long. 34° 36′ W. Current per hour, 1 mile, N. W. Barometer, 29.90; temperature of air, 81°; of water, 79°. Winds: S. E. by E., S. E., S. E.; fine weather and moderate breezes.

Jan. 13. Lat. 1° 27′ S.; long. 35° 45′ W. Barometer, 29.90; temperature of air, 82°; of water, 80°. Winds: S. E. by S.; S. S. E., S. E. Light wind, and rain squalls.

Jan. 14. Lat. 3° 52′ S.; long. 34° 31′ W. Current, 1 mile per hour, N. W. Barometer, 29.90; temperature of air, 83°; of water, 79°. Winds: S. E., S. E. by E., S. E. by E.; fine weather and light breeze; middle, fresh. Twenty-four days out, and I shall be very well satisfied if I can lay along the coast.

Jan. 15. Lat. 5° 55′ S.; long. 34° 42′ W. Current, same as yesterday. Barometer, 29.90; temperature of air, 84°; of water, 80°. Wind: E. S. E.; fine weather and moderate. No sounding with 90 fathoms.

Jan. 16. Lat. 8° 10′ S.; long. 34° 30′ W. Barometer, 29.90; temperature of air, 85°; of water, 80°. Winds: E. N. E., E., S. by E. At 2 P. M. made Point Pipa, west, 13 miles distant. The more we draw in shore the more the wind favors us. At midnight, passed within 5 miles of Cape Blanco.

The Storm behaved to admiration after she found herself jammed; she followed her guide, put off beating as long as she could, trusting to chance for a slant of wind. Though she crossed the equator as far as 35° 30′—and which is farther than is desirable, yet in 24 days out, from New York, she was clear of Cape St. Roque, despite that great old phantom of a bugbear, the westerly current.

Flying Childers (J. Dain White), Boston to San Francisco, 1852–3, 12 days out.

Dec. 30. Lat. 20° 05′ N.; long. 43° 38′ W. Barometer, 30.10; temperature of air, 75°; of water, 77°. Winds: E., E. N. E., E. N. E.; moderate trades.

Dec. 31. Lat. 17° 58′ N.; long. 41° 59′ W. Barometer, 39.10; temperature of air, 76°; of water, 77°. Winds: E. N. E., E., E.; moderate trades.

Jan. 1, 1853. Lat. 15° 31′ N.; long. 41° 30 W′. Barometer, 30.00; temperature of air, 77°; of water, 78°. Winds: E. S. E., S. E., E.; moderate trades.

Jan. 2. Lat. 13° 14′ N.; long. 40° W. Barometer, 30.00; temperature of air, 77°; of water, 78°. Winds: E., E., E. N. E.; moderate trades.

Jan. 3. Lat. 11° 10′ N.; long. 38° 25′ W. Barometer, 30.00; temperature of air, 77°; of water, 78°. Winds: E. N. E., E. N. E., E.; moderate trades.

Jan. 4 Lat. 9° 24′ N.; long. 36° 10′ W. Barometer, 30.00; temperature of air, 78°; of water, 78°. Winds: E. N. E., E. N. E., E. N. E.; moderate trades.

Jan. 5. Lat. 7° 17′ N.; long. 34° 10′ W. Barometer, 30.00; temperature of air, 78°; of water, 78°. Winds: E. N. E., E. N. E., E. N. E.; moderate trades.

Jan. 6. Lat. 5° 19′ N.; long. 33° 08′ W. Barometer, 30.00; temperature of air, 78°; of water, 78°. Winds: S. E., E., E. N. E.; light breezes with rain squalls.

Jan. 7. Lat. 4° 27′ N.; long. 30° 09′ W. Barometer, 30.00; temperature of air, 79°; of water, 79°. Winds: N. E., N. E., N. E.; gentle breezes with heavy rain squalls.

Jan. 8. Lat. 2° 55′ N.; long. 30° 04′ W. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: E. S. E., E. S. E., E. S. E.; first part squally, middle part fresh breezes, latter part calm.

Jan. 9. Lat. 2° 14′ N.; long. 30° 15′ W. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: S. W., S. E.; light airs and calm—all around the compass.

Jan. 10. Lat. 0° 09′ N.; long. 30° 29′ W. Barometer, 30.10; temperature of air, 82°; of water, 80°. Winds: S. E., S. E., S. E.; light trades, with fine weather.

Jan. 11. Lat. 2° 38′ S.; long. 31° 30′ W. Current, W., 20 miles. Barometer, 30.10; temperature of air, 81°; of water, 79°. Winds: S. E., S. E., S. E. Gentle breezes and clear.

Jan. 12. Lat. 5° 04′ S.; long. 32° 50′ W. Current, W. N. W., 30 miles. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: S. E., S. E., S. E. by E. Fine breezes and clear.

Ship Bald Eagle (P. Dumaresq), New York to San Francisco.

Jan. 16, 1853. Lat. 18° 56′ N.; long. 40° 32′ W. Barometer, 29.98; temperature of air, 77°; of water, 76°. Wind light and pleasant, S. ½ E., S. by E., S. S. E.

Jan. 17. Lat. 16° 13′ N.; long. 40° 7′ W. Barometer, 30.04; temperature of air, 76°; of water, 76°. Wind light and pleasant; braced sharp up; S. S. E., E. S. E., E. by S.

Jan. 18. Lat. 12° 44′ N.; long. 38° 26′ W. Barometer, 30.00; temperature of air, 76°; of water, 77°. Wind fresh and pleasant; braced sharp up; S. by E., E. by S., E. ½ S.

Jan. 19. Lat. 9° 49′ N.; long. 36° 12′. Barometer, 29.97; temperature of air, 76°; of water, 78°. Wind moderate and pleasant, braced sharp up; E., E. by S., latter part, east.

Jan. 20. Lat. 6° 41′ N.; long. 34° W. Barometer, 29.93; temperature of air, 78°; of water, 80°. Wind moderate and pleasant; braced sharp up; E., E., E. ½ N.

Jan. 21. Lat. 4° 19′ N.; long. 31° 50′ W. Barometer, 29.90; temperature of air, 80°; of water, 80°. Wind light; braced sharp up; E. ½ N., E., E. by N.

Jan. 22. Lat. 2° N.; long. 30° 8′ W. Barometer, 29.90; temperature of air, 82°; of water, 80°. Wind light through the night; repeated squalls; E. by N., E., E. by N.

Jan. 23. Lat. 0° 1′ S.; long. 31° 13′ W. Barometer, 29.92; temperature of air, 82°; of water, 80°.

Light trades, with a few squalls; first part, S. E. by S., S. E. ½ S., S. E. Crossed the equator; averaged 144 miles per day.

Jan. 24. Lat. 2° 9′ S.; long. 32° 20′ W. Barometer, 29.88; temperature of air, 82°; of water, 79°. Light trade-winds, S. E. ½ S., S. E. by E., S. E.

Jan. 25. Lat. 5° 5′ S.; long. 33° 30′ W. Barometer, 29.88; temperature of air, 82°; of water, 79°. Moderate trades, S. E., S. E., S. S. E. Passed to the westward of Fernando de Noronha.

Jan. 26. Lat. 8° 22′ S.; long. 34° 8′ W. Barometer, 29.94; temperature of air, 83°; of water, 80°. Moderate trades; braced sharp up; S. E. by E., S. E. by E., S. E. ½ E.

Jan. 27. Lat. 11° 27′ S.; long. 34° 37′ W. Barometer, 29.90; temperature of air, 83°; of water, 80°. Light trades; checked the braces, and set studding sails, the first chance since leaving New York; E. S. E., E. S. E., E.

Ship Eagle (John S. Farron), from New York to San Francisco, eighteen days out.

Jan. 25, 1853. Lat. 20° 1′ N.; long. 32° 58′ W. Barometer, 30.00; temperature of air, 74°; of water, 72°. Winds: E. by S., E. by N., E. by S. Strong breezes, first and middle, flawy; latter part, fair.

Jan. 26. Lat. 16° 43′ N.; long. 32° 10′ W. Barometer, 29.94; temperature of air, 76°; of water, 73°. Winds: E. by S., E. by S., E. Fine weather.

Jan. 27. Lat. 13° 37′ N.; long. 31° 35′ W. Barometer, 29.85; temperature of air, 76°; of water, 73°. Winds: E. N. E., E. by S., E. Fine weather.

Jan. 28. Lat. 11° 08′ N.; long. 30° 47′ W. Barometer, 29.86; temperature of air, 77°; of water, 75°. Winds: E. by N., E. N. E., E. by N. Light, with passing clouds from the S. W., and fair.

Jan. 29. Lat. 7° 59′ N.; long. 30° 16′ W. Barometer, 29.90; temperature of air, 81°; of water, 78°. Winds: E. by N., east, E. by S. Moderate and fair; clouds passing from S. S. W. At 10 A. M. we had the first light shower.

Jan. 30. Lat. 4° 13′ N.; long. 29° 5′ W. Barometer, 29.86; temperature of air, 79°; of water 79°. Winds fresh, E. S. E. First, cloudy; middle, do.; latter, dark cloudy weather, and heavy sea on.

Jan. 31. Lat. 0° 46′ N.; long. 29° W. Barometer, 29.86; temperature of air, 79°; of water 76°. Winds: E. S. E., E. by S., E. by S. fresh. First, cloudy; middle and latter, squally, with hard rain occasionally; latter part, wind variable, from E. N. E. to S. E.

Feb. 1. Lat. 1° 36′ S.; long. 29° 8′ W. Barometer, 29.85; temperature of air, 78°; of water, 78°. Winds: E. to E. N. E., N. E. to S., and E. to N. Variable winds and weather throughout, with dark cloudy weather and frequent hard squalls of heavy rain. At 3 P. M. a large shoal of porpoises going from S. W. to N. E.; at noon, a whirlwind passed astern of the ship.

Ship Tornado (O. R. Mumford), New York to San Francisco, fifteen days out.

Jan. 26, 1853. Lat. 22° 30′ N.; long. 37° 25′ W. Barometer, 30.15; temperature of air, 73°; of water, 74°. Wind: E. by N. during the 24 hours. Moderate breezes and fine weather. Distance, 203 miles. Ends with fresh breezes and fine weather.

Jan. 27. Lat. 18° 46′ N.; long. 35° 49′ W. Barometer, 29.95; temperature of air, 74°; of water, 75°. Winds: E. by N., east, and east. Fresh breezes, and cloudy rainy weather. Distance, 242 miles. During the afternoon frequent squalls of wind and rain, which appeared to rise in the N. E. and S. E., and meet, when the rain came down in torrents. Ends with rainy weather.

Jan. 28. Lat. 15° 16′ N.; long. 33° 53′ W. Barometer, 29.99; temperature of air, 71°; of water, 74°. Winds during the day east. Fine breezes and squally weather. Strong current riffs. Distance, 238 miles. At 6 P. M. saw a ship bound south, bearing E. S. E., distance 10 miles. Ends with moderate and baffling winds.

Jan. 29. Lat. 12° 20′ N.; long. 33° W. Barometer, 29.94; temperature of air, 73°; of water, 75°. Winds: E. by S., E. S. E., and E. by S. Moderate breezes and fine weather. Distance, 183 miles. The ship we saw last evening bearing N. by E., 13 miles distant. Strong current riffs. Ends, moderate breezes and fine weather.

Jan. 30. Lat. 9° 43′ N.; long. 31° 30′ W. Current, 18 miles, N.; barometer, 29.95; temperature of air, 78°; of water, 80°. Winds: E. by N., east, and east. Moderate breezes and fine weather. Distance, 180 miles. At 6 P.M. strong current riffs. Ends with fine breezes and fair weather; southerly sea. Distance sailed this month, by log, 3,532; by abstract, from noon to noon, 3,443.

Jan. 31. Lat. 5° 58′ N.; long. 30° 11′ W. Current, three-fourth mile N., 62° W. Barometer, 29.94; temperature of air, 79°; of water, 79°. Winds: E., E. by S., and E. by S. Fine breezes and cloudy weather. Distance, 238. Short heavy sea. Ends fine breezes and fine weather.

Feb. 1. Lat. 1° 56′ N.; long. 29° 49′ W. Barometer, 29.87; temperature of air, 79°; of water, 79° Winds: E., E. by S., and east. Fine breezes and fine weather. At 4 P.M. discovered a strong westerly current. Ends moderate breezes and fine weather.

Feb. 2. Lat. 1° 9′ S.; long. 30° 20′ W. Current, S. 80° W., 1½ mile per hour. Barometer, 29.89; temperature of air, 83°; of water, 81°. Winds: E. by S., E. by S., and E. S. E.; moderate breezes, and fine weather. At 2 P.M. crossed the equator, in long. 30° 06′ W. Ends light airs, inclined to calm. Dist. by log to the equator, 3,989; by observation, from noon to noon, 3,804.*

Feb. 3. Lat. 2° 41′ S.; long. 30° 40′ W. Barometer, 29.88; temperature of air, 80°; of water, 81°. Winds: E. S. E., E. S. E., and S. S. E.; light airs and squally, with rain; during the afternoon, wind veering from S. E. to N. E.; latter part steady, from the S. E. by S.

From H. T. Walter, of the Phantom.

We inclose herewith, the barque Phantom's abstract log, besides a few small collections of sea-weed. I noticed in your peculiar work, the longer the voyage, the more information; ours, for that reason, ought to be acceptable.

We have not put down the strength of the current, for the reason we had no opportunity of ascertaining its *correct rate*, and, unless such is done, it is more apt to mislead than to be beneficial. Likewise, our

* You will please note the distance differs but 90 miles, as given in your table, for the month of January.

navigation is omitted, as the morning and evening amplitudes differed several degrees. I did not like to mix aberration with variation, as it was only useful for us. Neither have we troubled our readers in the log with our misfortunes; although, three days from Cape Henry, we lost our jib-booms, gallantmast, etc., besides leaking badly, and hence we were not able at times to keep the vessel by the wind, and were compelled to go to eastward of your track, for fear we had to beat, which would have been a bad job without a jib. But we have paid the utmost attention to barometer, thermometer, state of weather, etc.

The barque Reindeer, which left the Capes with us, arrived the same day at Rio. I believe she crossed the line in 28° 00′.

The brig W. A. Steward left the Cape three or four days before us; and arrived the same day with us; she sighted Fernando de Noronha, and arrived with us the same day.

On an average, vessels which sailed before and with us, had very long passages for the time of the year.

The barque Inca, which sailed from Baltimore the 2d of January, arrived some days after us; her passage is therefore from 80 to 90 days. On the other hand, two vessels left Baltimore after us; one made the passage in 35, the other in 41 days. Last year, about the same month and date, I found strong winds from E. S. E., to E. N. E. in the same latitudes, where we had this time, W., S. W., and S. winds.

I crossed last year, in 20°, in 43°, 9° 46′, in 40° 00′, and 0° 15′ N., 33° 53′; tried to beat to windward, between 2° and 3° S., but lost some days for nothing. We then made the land to leeward of Cape St. Roque, and in beating for some days close in shore, weathered the land, having that voyage 57 days to Rio.

Another Letter from H. T. Walter.

BALTIMORE, *7th of November*, 1854.

"LIEUT. M. F. MAURY, U. S. N.

SIR: Again we have the pleasure of sending you three abstract logs of the barque Phantom.

I have on purpose withholden the abstracts, first, in not being too hasty to judge your route; secondly, if possible, to give our little experience on the same. I confess that, from the beginning, I was a little prejudiced in following your tracks. Not only I, but several masters of vessels I have seen upon the subject, having done several voyages from Europe to the East Indies, we were always in the habit of crossing the line far to eastward. Cape St. Roque was such a terror that it was never even mentioned; hence my prejudice. And, notwithstanding, the barque Phantom has not been particularly favored in following your tracks, we must come to the conclusion that there are currents, winds, moons, etc. etc.; that one or two degrees would be of much importance to the vessel; but, taking the favorable and unfavorable views of your route, I think it is entitled to much credit.

First, because of steadier breezes and the greater certainty of breezes between the N. E. and S. E. trades.

Secondly, because of avoiding those heavy squalls and calms. And when we take in consideration the waste of time, the losing of spars, and the chafing of materials, which are experienced to the eastward,

we must come to the conclusion that your route is the most favorable, even if we have, sometimes, to beat around Cape Roque.

You will see that, in July, 1853, the Phantom crossed the line about 33° 00′ long., and had no difficulty in reaching 6° 15′ S. without tacking. Again, in August, 1854, the line was crossed in about 32° 00′ long. W., and had mostly to tack to 8° 00′ S. First, we rather lost than gained, owing to the strong breezes and rain, being not able to stand close in shore; but, having once beating breezes and clear weather, we gained rapidly.

In working along the shore, we noticed the night in-shore tacks (although against the rule of land breezes), were the most favorable, and mostly lay up one or two points more to southward. I found not the least difficulty or danger in working along shore during the night, paying particular attention to the lead.

I again have omitted variation, because the amplitude observation never agrees with the variation of the chart. Ours, in most cases, is more westerly.

Currents are likewise omitted; first, because we have not the opportunity and knowledge to ascertain their correct rate and direction; secondly, currents which are found west to day, are east to-morrow; hence it must mislead every navigator. Even the famous Gulf Stream, this voyage, was so narrow that I hardly experienced any current. The pilots, however, told me that they had had an easterly wind for the last fourteen days. Even large quantities of gulf and sea-weed were found on the edge of soundings.

In July, 1853, between 5° 00′ and 8° 00′ latitude N., about 36° 00′ and 38° 00′ W., the current set us fast to eastward. Again, in August, 1854, about same lat. and long., the current set us about 110 miles N. N. E. I could not determine whether the current set us that much in one or three days, having had no observation in that time.

I have, however, paid a little more attention to the barometer. The same barometer was used in all three voyages. It stands rather lower than others; but being very sensitive, I did not like to alter it. The stand of the barometer between four o'clock and five o'clock in the morning, may be $\frac{1}{100}$ or $\frac{2}{100}$ of an inch out of the way, being not then watched as closely as at the other times."

I have often remarked the stress which navigators will lay, each upon his own experience, acquired even during one trip, as to winds and currents by the way. From this one voyage we often see conclusions drawn with great boldness, and rules for the guidance of mariners laid down with the confidence of perfect knowledge. "A little learning—." The Pilot, and other charts of the series, furnish the experience—not the opinions—the facts, the carefully observed and faithfully recorded facts, of thousands of navigators, as to the winds and currents encountered by them; and yet, with all these data before me, I often find it exceedingly difficult to come to any satisfactory conclusions as to winds, and currents, and routes, or to lay down sailing directions which shall hold good alike for all.

I was reminded by this last letter of Capt. Walter, to examine, and see how much experience the abstract logs in this office afford as to the difficulties of clearing Cape St. Roque when one crosses the line

west of long. 32°. Considering the ideas which have been unwittingly instilled into our minds as to awful currents, and the dangers which beset vessels that cross so far to the west, I was surprised to find how trifling, really, those difficulties are when they come to be tried. I have examined the logs of 78 vessels, bound south, that have crossed the equator to the west of 32°, and of these 78 vessels, 17 crossed to the west of long. 34°, and two of them only, viz: the Huma, that crossed in 37° 10′, and the Levanter, that crossed in 35° 28′, were more than a week in clearing Cape St. Roque—the former was 8, the latter 19 days. Two weeks in the equatorial doldrums, east of 25°, is common, and three weeks is not uncommon. The average of these 17, from the line to the fair way, off Cape St. Roque, was a fraction more than 5 days. And, if we take away the two unfortunates just mentioned, the average time from the line west of long. 34° to the parallel of St. Roque, is only a fraction over 4 days, which is about the average time from the line to the same parallel by the old route. Of these seventeen, the Sovereign of the Seas crossed in 36°, and had three days. The Hudson Trask crossed in 35°, and shot past in two days. The Belle of the West took seven days from 35° 45′; and the Golden State the same time to clear this cape of fabulous terror, after having crossed the line in 36° 38′. Suppose experience to decide that it will take one week, on the average, to clear Cape St. Roque, after having crossed the line in (say) 35°—let us, upon this supposition, compare the passage by this crossing, with the length of passages by the old crossings, say between 20° and 25° W. A vessel, after crossing in 25°, is generally forced to sight St. Roque, and certainly it is, to vessels from the United States, nearer to cross the equator in 35° and sight St. Roque a week afterwards, than it is to do it after crossing the line in 25°, and sight it in 3 days afterwards. Vessels, especially in summer and fall, that find themselves as far west as 36° or 37° when they lose the N.E. trades, will very frequently find the southwardly monsoons between the two systems of trades sufficiently strong and steady to carry them to the eastward at the rate of 100 miles or more for a couple of days, and so enable vessels thus falling to leeward, to fetch up leeway, by standing to the eastward as far as 32° or 33°.

Commodore Mervine's remarks in the following letter bear upon this subject:—

U. S. SHIP INDEPENDENCE,
RIO DE JANEIRO, *Nov.* 1854.

SIR: A fair opportunity has been afforded me of testing the soundness of your advice, in crossing the equator "to stand on boldly towards St. Roque, instead of endeavoring to make easting in order to avoid being 'back-strapped.'" Now, this catastrophe happened to me, but occasioned no more than eighteen or twenty hours' detention.

Having pursued the course recommended by you after entering the doldrums, I stood on, crossed the equator in 33° 53′ west long., at 11 A. M. on the 15th November, and made land on the 17th, at 11 A. M., twenty five miles to leeward of St. Roque. The prospect of working so far to windward, against a strong current (which I was induced to believe existed), in a leewardly ship like the Independence, was rather

inauspicious. It was accomplished, however, during that afternoon and night, by making short tacks off and on the Bank of St. Roque, in nine and ten fathoms water.

On the 18th, at 8 A. M., the Cape was under our lee, distant about twelve miles, and the wind at east, which enabled us to lay our course along the land.

We lost the N. E. trades in 8° N. lat., and got the S. E. trades in 3° N. lat., very far to the southward, S. by E.; which, after we had crossed the equator, and as we approached the coast, gradually favored us more and more to the eastward, especially during the night.

From the frequency and comparative ease with which vessels beat around the Cape, I am inclined to believe that the winds in that vicinity are considerably modified by the land, and will be found generally to prevail from the eastward.

I am, very respectfully,

Your obed't serv't,

WM. MERVINE,

Appointed to Command Pacific Squadron.

LIEUT. M. F. MAURY, U. S. N.,

National Observatory, Washington, D. C.

I have endeavored to impress navigators who attempt the new route, and who use these Sailing Directions, with a sense of the advantages which they gain by standing boldly on when they begin to feel pinched, preferring rather to trust to chances for slants and favorable changes than to attempt to beat up, or to stand back to the northward in order to make easting. They can but do that after they have stood their chance, made the land, and fallen to leeward. Then they can but beat at last, taking advantage, as they always should whilst near or far from the land, of favorable slants of the wind.

I received this morning the abstract logs of two vessels, which will serve to illustrate the propriety of this course. I might quote great numbers of cases; but I give the most recent, because it presents a fair average case. Indeed, the George Raynes hardly presents the case in as favorable a point of view as usual, for she had a longer time than the average from the line to the fair-way off Cape St. Roque.

She, I take it, is not a clipper; nevertheless, she and the fine clipper ship Starlight, left New York and Boston in the same month for the fair-way off St. Roque, and beyond. Up to this point I quote their abstracts. I quote from the abstract log of each, because the log of the clipper, who did not feel so closely pinched, serves to illustrate the propriety of Bachelder's course, who did feel pinched, and who did right, notwithstanding he did it doubtingly. Indeed, the Starlight would have done better if she had been a little more bold, and had not hugged the wind so closely. She crossed the line in 29° the 25th day out, and was five days thence to the fair-way off Cape St. Roque.

Bachelder, on the other hand, came along, crossing the parallels of 30°, 20°, and 10° N., 13°, 11°, and 7° to the westward of her computed route,* reaching the line in 32° the 26th day out, with 6 days thence

* See Table of Crossings, New Route to Rio for April, p. 459.

to the fair-way off St. Roque. Now, suppose Bachelder had yielded to the suggestions of timidity and stood to the northward and eastward, on the 2d April, as he had "a half a mind to;" the probabilities are that for every day he stood to the N. E., he would have lost two in reaching the line; and, did he not act wisely and prudently to put off tacking as long as he could, and so take his chances for any favorable change? Clearly so; and the two logs show it.

Ship George Raynes (N. A. Bachelder), New York to Valparaiso.

March 26. Lat. 39° 05′ N. Barometer (aneroid) 29.46; temperature of air, 38°; of water, 54°. Wind: N. W. throughout. Throughout, strong gales and passing squalls of hail and snow.

March 27. No observation. Current, 50 miles E. N. E. Barometer, 29.40; temperature of air, 40°; of water, 69°. Wind: W. N. W., throughout. Throughout, hard gales and squalls of snow, hail, and rain.

March 28. Lat. 37° 15′ N.; long. 60° 48′ W. Barometer, 29.60; temperature of air, 50°; of water, 62°. Wind: W. N. W. to N. W. First part, moderate; latter part, hard gales and squalls.

March 29. Lat. 36° 55′ N.; long. 59° W. Barometer, 29.60; temperature of air, 50°; of water, 69°. Winds: N., N., N. W. First and middle parts, light breeze, rough, heavy swell; latter part, fresh gales and squally.

March 30. Lat. 36° 46′ N.; long. 56° W. Barometer, 29.90; temperature of air, 52°; of water, 62°. Wind: W. N. W. to N. W. ¾ N. First part, fresh gales; middle and latter parts, light breezes and pleasant.

March 31. Lat. 36° 35′ N.; long. 54° 24′ W. Barometer, 30.30; temperature of air, 58°; of water, 63°. Wind: N. W. to W. S. W. Light breezes, and rain squalls occasionally; "light."

April 1. Lat. 35° 05′ N.; long. 51° 19′ W. Barometer, 30.50; temperature of air, 64°; of water, 63°. Winds: N. E., E. N. E., E. by N.; first part, moderate; middle and latter parts, strong breezes and passing clouds.

April 2. Lat. 31° 59′ N.; long. 51° 05′ W. Barometer, 30.50; temperature of air, 66°; of water, 65°. Winds: E., S. E., S. E. by E.* Moderate breezes and pleasant.

April 3. Lat. 29° 04′ N.; long. 51° 03′ W. Barometer, 30.30; temperature of air, 71°; of water, 68°. Winds: E. S. E., E. S. E., S. E. by E.; moderate breezes and pleasant.

April 4. Lat. 26° 56′ N.; long. 49° 23′ W. Barometer, 30; temperature of air, 74°; of water, 71°. Winds: E. by S., E., E. by N.; moderate breezes and pleasant.

April 5. Lat. 25° 21′ N.; long. 46° 54′ W. Barometer, 30; temperature of air, 70°; of water, 71°. Winds: E. N. E., E. N. E., N. E. by N. to E. N. E.; first and middle parts, moderate breezes; latter part, light, unsteady, and baffling; large swell from N. E.

* "I don't know whether I am doing right or not in standing so long to the southward. We have made a good south course these twenty-four hours. It seems a pity to go on the other tack. Can't make better than a N. E. course; might as well be lying still."

April 6. Lat. 23° 26′ N.; long. 46° 27′ W. Barometer, 30.08; temperature of air, 76°; of water, 73°. Winds: E. N. E., E. by S., S. E. by E.; light baffling breezes and squally appearances.

April 7. Lat. 21° 44′ N.; long. no observation. Barometer, 30.10; temperature of air, 78°; of water, 74°. Winds: E. S. E., S. E. by S., S. E. by E.; light baffling breezes throughout; stood to the N. E. four hours.

April 8. Lat. 20° 54′ N.; long. 45° 30′ W. Barometer, 30.10; temperature of air, 77°; of water, 74°. Winds: E., E. N. E., E. N. E.; light baffling breezes throughout; pleasant, smooth sea.

April 9. Lat. 19° 35′ N.; long. 44° 12′ W. Barometer, 30.10; temperature of air, 77°; of water, 74°. Winds: E. N. E., N. E. by E., E. by N.; light baffling breezes throughout; *sharp braced.*

April 10. Lat. 17° 39′ N.; long. 42° 49′ W. Barometer, 30.10; temperature of air, 81°; of water, 74°. Winds: E. ¾ N., from E. N. E. to E. by S.; moderate breezes and pleasant.

April 11. Lat. 14° 59′ N.; long. 41° 15′ W.* Barometer, 30.10; temperature of air, 75°; of water, 75°. Winds: E., E. by S., E.; good breezes and pleasant; middle and latter parts, overcast.

April 12. Lat. 12° 53′ N.; long. 39° 38′ W. Barometer, 30.10; temperature of air, 78°; of water, 77°. Winds: E., E. by N., E.; first and middle parts, strong breezes and cloudy, "head sea;" latter part moderate.

April 13. Lat. 10° 47′ N.; long. 37° 56′ W. Barometer, 30.05; temperature of air, 79°; of water, 77°. Winds: E., E. by N., E.; good breezes and cloudy.

April 14. Lat. 8° 37′ N.; long. 35° 52′ W. Barometer, 30; temperature of air, 80°; of water, 77°. Winds: E. by N., E. N. E., E. N. E.; good breezes, pleasant, "hazy."

April 15. Lat. 6° 06′ N.; long. 34° 03′ W. Barometer, 30; temperature of air, 82°; of water, 79°. Winds: E. by N., E., E. by N.; pleasant breezes and hazy.

April 16. Lat. 4° 06′ N.; long. 32° 05′ W. Barometer, 30; temperature of air, 83°; of water, 79°. Winds: E. by N., E. N. E., E. N. E.; good breezes and hazy; latter part, heavy showers of rain, wind light and unsteady.

April 17. Lat. 2° 50′ N.; long. 31° 26′ W. Barometer, 29.95; temperature of air, 81°; of water, 81°. Winds: E. N. E., E., E. by S. Light baffling breezes and showers of rain; in rain squalls, wind hauls to S. E. by S.; "tide rips;" lightning to S. S. E. and E.

April 18. Lat. 2° 09′ N.; long. 31° 26′ W. (D. R.). Barometer, 29.95; temperature of air, 81°; of water, 81°. Wind: E. to S. E.; light baffling airs and calms; frequent showers of rain.

April 19. Lat. 0° 45′ N.; long. 31° 47′ W. Current, 30 miles S. E. Barometer, 29.98; temperature of air, 88°; of water, 81°. Wind: S. E. to S. E.; light breezes and calms; latter part, heavy showers of rain; stood E. N. E. three hours.

April 20. Lat. 1° S.; long. 32° 06′ W. Current, 10 miles easterly. Barometer, 29.98; temperature of air, 84°; of water, 81°. Wind: S. E. by E. to S. E. by S.; light breezes throughout, and frequent

* Too far to leeward again. Don't see how I could have helped it. Trust the wind will favor me, so that I shall be in a good position to cross the equator.

showers of rain. At 11 P. M., *crossed the equator in long.* 31° 55′ *W.*, 25 *days* 15 *hours from Sandy Hook.* Distance sailed to the equator by observation, from noon to noon, 3,753 miles; by Maury's tables, 3,811 miles.

April 21. No observation. Current, 10 miles westerly. Barometer, 29.95; temperature of air, 85°; of water, 82°. Wind: E. S. E. to S. S. E.; first and latter parts, light baffling breezes and light rain squalls; middle part, calm.

April 22. Lat. 3° 18′ S.; long. 32° 32′ W. Current, 10 miles westerly. Barometer, 29.95; temperature of air, 84°; of water, 82°. Winds: E. by S. to S. E. by S., S. E., S. E. by S.; first part, light baffling winds and heavy showers of rain; middle and latter parts, moderate breezes and cloudy. Stood E. N. E. 4 hours.

April 23. Lat. 3° 37′ S.; long. 33° W. Current, N. W. by W., 30 miles. Barometer, 29.97; temperature of air, 83°; of water, 81°. Wind: S. E. by S. to S. by E.; moderate breezes throughout. Stood to the eastward 11 hours.

April 24. Lat. 3° 57′ S.; long. 33° W. Current, W. N. W., 17 miles. Barometer, 29.97; temperature of air, 83°; of water, 81°. Winds: S. S. E., E. S. E., S. E. by E.; first part, light breezes; at 9 P. M., wind shifted in a squall to E. S. E.; middle part, light baffling winds and heavy showers of rain; lightning to the eastward; calm at times; latter part, light breezes and frequent showers of rain.

April 25. Lat. 6° 31′ S.; long. 33° 47′ W. Barometer, 29.97; temperature of air, 83°; of water, 81°. Winds: S. E. by E., S. E. by E., S. S. E.; moderate breezes and light rain squalls.

April 26. Lat. 8° 07′ S.; long. 34° 35′ W. Barometer, 29.97; temperature of air, 84°; of water, 82°. Winds: S. from S. E. to S. S. E.; moderate breezes and passing clouds of rain; light.

Ship Starlight (J. Chase), Boston to San Francisco.

March 17, 1854. Lat. 41° 19′ N.; long. 67° 25′ W. Barometer, 29.2; temperature of air, 52°; of water, 39.° Winds: W. S. W. to S., S. to W., N. W., W. N. W. At 10 A. M., sailed from Lewis's wharf; at noon, discharged the pilot off the "Light." Light breezes from W. S. W. until 3 P. M.; fresh from S. to 9 P. M.; rigging stretching; in royals and topgallant sails; middle part, wind hauled W. N. W. in a squall, where it remained, with fine weather.

March 18. Lat. 41° 19′ N. (D. R.); long. 64° W. Barometer, 29.1; temperature of air, 50°; of water, 42°. Winds: W. N. W., S. S. E., W. First part, fine weather; middle part, heavy gale from S. S. E. to S., with sharp lightning, heavy thunder, and torrents of rain. At 5 P. M., wind shifted suddenly to west in a heavy squall of wind and rain.

March 19. Lat. 39° N.; long. 59° 53′ W. Barometer, 29.6; temperature of air, 50°; of water, 64°. Winds: W. by N., W., N. W. Strong breezes, with heavy hail squalls; under double reefs.

March 20. Lat. 37° 25′ N.; long. 56° W. Barometer, 29.9; temperature of air, 54°; of water, 66°. Winds: S. W., S. W., W. N. W. Exceedingly squally throughout these 24 hours; was obliged to run off more to the eastward than I wished; highest barometer I ever saw for such a wind and such weather, and standing steady.

March 21. Lat. 36° 28′ N.; long. 51° 56′ W. Barometer, 29.8; temperature of air, 54°; of water, 66°. Winds: S. W., W. S. W., S. W. Hard rain squalls throughout the day.

March 22. Lat. 34° 43′ N.; long. 48° 32′ W. Barometer, 29.9; temperature of air, 58°; of water, 64°. Winds: W., S. W., S. W. Hard rain squalls throughout the day.

March 23. Lat. 32° 43′ N.; long. 45° 44′ W. Barometer, 30; temperature of air, 58°; of water, 68°. Winds: N. W. throughout. Brisk breezes, with frequent squalls; latter part, moderate.

March 24. Lat. 32° 43′ N.; long. 44° 10′ W. Barometer, 30.3; temperature of air, 68°; of water, 63°. Winds: N. W., calm, S. S. E. Fine weather; had intended to strike the latitude of 30° in longitude 43°, but this wind throws me off the track.

March 25. Lat. 31° 55′ N.; long. 40° 56′ W. Barometer, 30.4; temperature of air, 70°; of water, 69°. Winds: S. by E., S., S. S. W. Fine weather; but the wind still pushes me to the eastward.

March 26. Lat. 30° 26′ N.; long. 38° 10′ W. Barometer, 30.4; temperature of air, 70°; of water, at surface, 70°; of water, ten feet below surface, 70°. Winds: S. by W. throughout. Fine weather; but the wind still pushes me to the eastward.

March 27. Lat. 29° 43′ N.; long. 36° 20′ W. Barometer, 30.5; temperature of air, 70°; of water, at surface, 70°; of water, ten feet below surface, 70°. Winds: S. by W., S. by W., S. W. Light air and baffling, from S. to S. W.; still going too much to the eastward. At 9 A. M., saw three whales, apparently of the fin-back tribe. Latter part, nearly calm; irregular swell; small Portuguese man-of-war floating by.

March 28. Lat. 29° 30′ N.; long. 35° 44′ W. Barometer, 30.5; temperature of air, 72°; of water, 70°. Calms throughout, with a long, irregular swell of the sea. At 9½ A. M., light breeze from S. S. E.; at 10 A. M., tacked to S. W.

March 29. Lat. 27° 57′ N.; long. 36° 20′ W. Barometer, 30.6; temperature of air, 72°; of water, 70°. Winds: S. S. E., calm, S. E. First part, light airs from S. S. E.; middle part, calm; ends brisk, at S. E. by S.

March 30. Lat. 25° N.; long. 36° 20′ W. Barometer, 30.5; temperature of air, 72°; of water, 72°. Winds: S. E. by E., E. S. E., S. E. Brisk breezes, with frequent rain squalls; wind veering from E. S. E. to S. S. E.; barometer falling one-tenth; saw "flying-fish" for the first time; long swell from N. W.; water clear, and free from grass of any kind.

March 31. Lat. 22° 12′ N.; long. 35° 50′ W. Barometer, 30.4; temperature of air, 74°; of water, 72°. Winds: S. E., S. E., E. S. E. Light breezes, with dry squalls; wind veering from E. to S. S. E.; ship going from three to eleven knots; no weed; swell from N. W.

April 1. Lat. 19° 21′ N.; long. 34° 03′ W. Barometer, 30.3; temperature of air, 74°; of water, at surface, 73°; of water, ten feet below surface, 73°. Winds: E. to E. S. E., E. by N. to E. by S., E. Commences strong breezes, with squalls; middle part, light breezes, but still hard squalls; latter part, moderate, and less wind in the squalls; water still clear; no weed; no grass; at meridian, wind hauled S. E. in a squall.

April 2. Lat. 15° 56′ N.; long. 33° 10′ W. Barometer, 30.2; temperature of air, 74°; of water, 74°. Winds: E. S. E., E. by S., E. S. E. First part, light baffling breezes and squally; middle part,

strong breezes and cloudy weather; latter part, brisk breezes with squalls. Barometer veering from 30.3 to 30.2, ending at the latter; ship close hauled; sea clear.

April 3. Lat. 13° 03′ N.; long. 32° 12′ W. Barometer, 30.2; temperature of air, 75°; of water, at surface, 75°; of water, at ten feet below surface, 74°. Winds: E. S. E., E. by S., E. by S. Light breezes, veering from E. to E. S. E., throughout these 24 hours; sea smooth and clear.

April. 4. Lat. 12° N. (D. R.); long. 31° 42′ W. Barometer 30.2; temperature of air, 77°; of water at surface, 80°; of water at ten feet below surface, 77°. Winds: E. to E. N. E., calm, calm; first part, light breezes from E., to E. N. E., middle and latter parts, calm. There appeared to be a sudden increase in the surface heat of the water; but, after several trials, the result was as recorded in the columns. Small (what sailors call Portuguese) man-of-war around the ship.

April 5. Lat. 11° 40′ N. (D. R.); long. 31° 42′ W. Barometer, 30.2; temperature of air, 78°; of water at surface, 78°; of water ten feet below surface, 78°. Calm throughout, with a long swell of the sea from N. N. W., and light puffs of wind from every point.

April 6. Lat. 9° 24′ N.; long. 31° 04′ W. Barometer, 30.2; temperature of air, 78°; of water 78°. Winds: N. E., E., S. E. by E; first part, light airs from N. E.; middle part, E.; long swell from north.

April 7. Lat. 7° 28′ N.; long. 30° 34′ W. Barometer, 30.3; temperature of air, 81°; of water at surface, 80°; of water ten feet below surface, 80°. Winds: E. S. E., E., E.; light breezes and fine weather throughout these twenty-four hours.

April 8. Lat. 4° 19′ N.; long. 29° 30′ W. Barometer, 30.3; temperature of air, 83°; of water, 82°. Wind: E. throughout; brisk breezes and fine weather throughout these twenty-four hours.

April 9. Lat. 1° 50′ N.; long. 29° 10′ W. Barometer, 30.2½; temperature of air, 82°; of water at surface, 82°; of water 10 feet below surface, 82°. Winds: E., E., baffling; first two parts, light breezes from east; latter part, squalls and calm; wind from E. to S., and heavy rain; barometer veering several times from 30.3 to 30.2 and back again.

April 10. Lat. 0° 30′ N.; long. 29° W. Barometer, 30.2½; temperature of air, 82°; of water at surface, 82°; of water 10 feet below surface, 82°. Winds: baffling, E., variable; at thirty minutes P. M., had a hard squall from S. S. W., with heavy rain; at 4 P. M., calm, light breezes from east; through the night with passing squalls; ends, E. N. E. with squalls.

April 11. Lat. 0° 40′ S.; long. 29° W. Barometer, 30.2½; temperature of air, 81°; of water, 82°. Winds: E. by N., E. by S., calm; first part, light breezes from E. N. E.; at 4 P. M., hard squall of wind, with heavy rain; wind light from E. through the night; squally and calm towards morning; ends calm; sea heaving from the south.

April 12. Lat. 1° 40′ S.; long. 29° 21′ W. Barometer 30.2½; temperature of air, 84°; of water at surface, 83°; of water 10 feet below surface, 82°. Winds: S., calm, E. by S.; squall from south; middle part, calm, with heavy rains; latter part, light breeze from E. by S.; sea still heaving from south.

April 13. Lat. 2° 36′ S.; long. 29° 47′ W. Barometer, 30.2½; temperature of air, 82°; of water, 83°. Winds: calm, calm, S. S E.; first and middle parts, calm, with occasional puffs from every point of the compass, and torrents of rain; barometer rose and fell one-tenth, three times during the first sixteen hours.

April 14. Lat. 5° S.; long. 31° 15′ W. Barometer, 30.2; temperature of air, 82°; of water, 83°. Winds: S., S. S. E., S. E.; first part, squall from south; middle part, strong breeze from S. S. E., latter part, steady and brisk from S. E., with fine weather.

April 15. Lat. 8° 23′ S.; long. 32° 30′ W. Barometer, 30.2; temperature of air, 84°; of water, 85°. Winds: S. E. ½ E., S. E. ½ E., S. E.; brisk mainsail breeze, head S. S. W., with fine weather throughout.

I would here observe that I have experienced no perceptible current, since leaving the Gulf Stream. I have taken sights, morning and evening, and these and the longitude agreed so nearly with the log, that I chose to ascribe the trifling error to the log, rather than put it down as current, when I was not certain of it. There has been opportunity of trying the current; but with a new ship, and her rigging stretching very much, we have always been very busy on such occasions.

Ship Phantom (A. J. Hallett), Boston to San Francisco, seventeen days out.

Jan. 24, 1853. Lat. 20° 55′ N.; long. 42° 00′. No perceptible current; variation observed, 16° W. Barometer, 30.2; temperature of air, 76°; of water, 75°. Winds: S. E. by E., E. S. E.; gentle breezes and squally, with rain at times. Still heavy clouds lying along in the S. and W.; unfavorable trades.

Jan. 25. Lat. 17° 40′ N.; long. 42° 40′ W. Heavy ripples; variation observed, 16° W. Barometer, 30.00; temperature of air, 76°; of water, 74°. Winds: E. S. E., S. E. by E., E. S. E.; squally with rain; with lightning, during the night.

Jan. 26. Lat. 14° 10′ N.; long. 41° 29′ W. Ripples. Variation observed, 15° W. Barometer, 30.00; temperature of air, 77°; of water, 74°. Winds: E. by S., E. by N., E by N.; squally weather with rain. Sea very blue and transparent. Doing my best to fetch Cape St. Roque, as I have every confidence in your Wind and Current Charts.

Jan. 27. Lat. 11° 20′ N.; long. 39° 05′ W. Heavy tide rips. Variations observed, 4° W. Barometer, 30.00; temperature of air, 78°. Wind: E. N. E. throughout. Gentle breezes during the day. Passed several heavy ripples, apparently tide rips; passing clouds during the 24 hours, and smooth sea. Saw plenty of flying-fish.

Jan. 28. Lat. 8° 40′ N.; long. 37° 43′ W. Variations observed, 3° W. Barometer, 29.8; temperature of air, 79°; of water, 78°. Wind: E. N. E. throughout. Moderate breezes throughout the day, and passing clouds. Saw lots of flying-fish.

Jan. 29. Lat. 6° 12′ N.; long. 35° 03′ W. Ripples at times. Variations observed, 3° W. Barometer, 29.9; temperature of air, 80°; water, 79°. Winds: N. E. by E. throughout. Moderate breezes and cloudy, with squalls of wind and rain.

Jan. 30. Lat. 3° 40′ N.; long. 33° 13′ W. Current (if any), to the S. E. Variations observed, 3° W. Barometer, 29.8; temperature of air, 80°; of water, 79°. Winds: E., S. E., E. N. E.; gentle breezes throughout the day, with squalls of rain, and smooth sea.

Jan. 31. Lat. 0° 40′ N.; long. 32° 55′ W. Variations observed, 2° W. Barometer, 29.9; temperature of air, 78°; of water, 78°. Winds: E. N. E., E. N. E., N. E.; gentle breezes, and squally.

Feb. 1. Lat. 1° 54′ S.; long. 31° 55′ W. Variations observed, 2° W. Barometer, 29.9; temperature of air, 80°; of water, 79°. Winds: E., N. E., calm, N. E. by E.; first and latter parts, light breezes; middle, calm, with plenty of rain.

Feb. 2. Lat. 4° 06′ S.; long. 31° 45′ W. Variations observed, 2° W. Barometer, 29.8; temperature of air, 81°; of water, 79. Winds: E., S. E., S. E.; light breezes, and squally, with a smooth sea.

Ship A. Cheseborough (R. C. Cheseborough), New York to San Francisco, thirteen days out.

Jan. 26, 1850. Lat. 22° 13′ N.; long. 43° 00′ W. Barometer, 30.10; temperature of air, 76°; of water, 77°. Winds: S. E. by E., E., E. S. E.; first part, strong gales; middle part, with heavy squalls; latter, pleasant. I must here remark that, during the many passages I have made through the so-called N. E. trades, I have never known them to hang so far to the south at this season, in this latitude and longitude. [What do the Pilot Charts say?]

Jan. 27. Lat. 20° 03′ N.; long. 41° 05′ W. Barometer, 29.90; temperature of air, 76°; of water, 77°. Winds: E. S. E., E. N. E., N. E. by E.; first part, strong gales. At 4 P. M. wind changed to E. N. E.; middle part, the same. At 4 A. M. wind fresh from N. E. by E.; latter part, the same, with pleasant weather; close by the wind.

Jan. 28. Lat. 18° 01′ N.; long. 39° 30′ W. Barometer, 29.90; temperature of air, 77°; of water, 77°. Wind: E. N. E.; heavy rain, squalls throughout.

Jan. 22. Lat. 16° 36′ N.; long. 38° 15′ W. Barometer, 29.70; temperature of air, 76°; of water, 78°. Winds: E. N. E., E. S. E., E. N. E.; begins with moderate breezes and light rain squalls; middle part, light and pleasant. At 2 A. M. wind variable from E. S. E. to S. At ten, wind steady at E. N. E.; latter part, the same.

Jan. 30. Lat. 14° 23′ N.; long. 36° 48′ W. Current, E. S. E., 24 miles. Barometer, 29.90; temperature of air, 76°; of water, 78°. Winds: E. N. E., E. S. E., E. S. E.; first part, wind light and pleasant; middle and latter parts, light and pleasant. At 2 P. M. wind at E. S. E. I have this day found an easterly set of 1 mile. In my previous voyages across the line, I have often experienced such a current between 5° and 8° north latitude, and 36° and 32° west longitude, but never so far north before.

Jan. 31. Lat. 11° 54′ N.; long. 36° 22′ W. Barometer, 29.80; temperature of air, 78°; of water, 78°. Winds: E., E. S. E., E. by S.; first part, moderate breezes, and clear; middle and latter parts, variable and inclining to the southward.

Feb. 1. Lat. 9° 56′ N.; long. 34° 56′ W. Barometer, 29.80; temperature of air, 79°; of water, 80°. Winds: E., E. by N., E. N. E. Pleasant breezes, and clear; at midnight, wind more to the northward and eastward.

Feb. 2. Lat. 8° 11′ N.; long. 32° 55′ W. Barometer, 29.80; temperature of air, 80°; of water, 80°. Winds: E. by N., E. N. E., E. N. E. Fine breezes, with light rain squalls, latter part.

Feb. 3. Lat. 6° 28′ N.; long. 31° 15′ W. Barometer, 29.80; temperature of air, 80°; of water, 80°.

Winds: E. N. E., E. by N. E. Moderate and light breezes, and pleasant weather, with occasionally rain squalls.

Feb. 4. Lat. 4° 35′ N. (D. R.); long. 29° 50′ W. Barometer, 29.70; temperature of air, 82°; of water, 81°. Winds: E. N. E., do., N. E. Begins with light winds and light rains. Middle, squally and rainy; latter part, N. E., wind with light rain and every appearance of losing the trades.

Feb. 5. Lat. 3° 08′ N.; long. 28° 40′ W. Barometer, 29.80; temperature of air, 80°; of water, 81°. Winds: N. E., E., E. N. E. Winds light and variable, with heavy rain squalls during the first and middle; latter part clear and steady.

Feb. 6. Lat. no obs.; long. 28° 30′ W. (D. R.). Barometer, 29.70; temperature of air, 80°; of water, 80°. Winds: E. S. E., calm, S. E. First part, light airs; middle part heavy; 2 A. M. a light breeze. Ends moderate with passing clouds. Barometer, 29.70 to 29.95.

Feb. 7. Lat. 1° 40′ N.; long. 28° 20′ W. (D. R.). Barometer, 29.70; temperature of air, 80°; of water, 81°. Winds: E. S. E., calm. Begins with a moderate breeze and cloudy. Middle and latter parts, calm with light rain.

Feb. 8. Lat. 1° 39′ N.; long. 29° 40′ W. Barometer, 29.70; temperature of air, 80; of water, 81°. Winds: variable, calm, S. E. Begins with light airs from S. E. to S., with light rain squalls. Ends with light airs and clear.

Feb. 9. Lat. 1° 07′ N.; long. 31° 15′ W. Barometer, 29.90; temperature of air, 82°; of water, 81°. Winds: calm, S. S. W., S. S. W. At 8 P. M. light breeze with rain. Midnight clear. Ends moderate and clear. At noon tacked to the eastward.

Feb. 10. Lat. 0° 30′ N.; long. 31° 14′ W. Barometer, 29.80; temperature of air, 83; of water, 82°. Winds: S. S. W., to S. S. W., S. E. Commences light and clear; 8 P. M. tacked to westward. At 1 A. M. squally with rain, wind light and variable. Ends light and steady.

Feb. 11. Lat. 1° 11′ S.; long. 31° 28′ W. Barometer, 29.80; temperature of air, 82°; of water, 82° Winds: S. E., S. E., by E., do. Light winds and clear. Crossed the equator at 9 h. 20 m. P. M.; long. 31° 20′; 30 days from Sandy Hook.

Feb. 12. Lat. 3° 16′ S.; long. 31° 49′ W. Barometer, 29.70; temperature of air, 82°; of water, 82°. Winds: S. E. by E., do., S. E. First and middle parts, light and pleasant; latter moderate.

Feb. 13. Lat. 5° 42′ S.; long. 33° 12′ W. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: S. E. by S., S. E. by E., do. Moderate breezes and clear. 1 h. 30 m. P. M. made the island Fernando de Noronha, bearing per comp. S. W. 45 miles; passed within six miles of it.

Ship Esther, Boston to San Francisco.

Jan. 26, 1853. Lat. 19° 05′ N.; long. 37° 50′ W. Variation, 11° westerly. Barometer, 29.40; temperature of air, 74°; of water, 75°. Winds: E., E. N. E., and E. N. E. First part, squally; latter part, strong breeze.

Jan. 27. Lat. 16° 08′ N.; long. 36° 22′ W. Variation, 14° W. Barometer, 29.40; temperature of

air, 74; of water, 75°. Winds: E. N. E., N. N. E., and E. by N. Fine breezes, a squall from the S. S. W. at midnight.

Jan. 28. Lat. 13° 48′ N.; long. 35° 15′ W. Barometer, 29.30; temperature of air, 74°; of water, 75°. Winds: E., E. by S., and E. by S. Light breezes and pleasant weather.

Jan. 29. Lat. 11° 40′ N.; long. 34° 25′ W. Temperature of air, 76°; of water, 77°. Winds: E., and E. by S. Light breezes, with squalls from the south.

Jan. 30. Lat. 9° 56′ N.; long. 32° 35′ W. Temperature of air, 77°; of water, 78°. Wind: E. N. E. throughout. Light breezes.

Jan. 31. Lat. 7° 25′; long. 31° 05′ W. Temperature of air, 79; of water, 80°. Wind: E. N. E. throughout, fresh breezes and cloudy, with occasional rain.

Feb. 1. Lat. 4° 40′ N. long. 30° 05′ W. Barometer, 29.30; temperature of air, 79; of water, 80°. Winds: E. by S., E. N. E., and E. N. E. Moderate, with squalls; a heavy head sea.

Feb. 2. Lat. 2° 04′ N.; long. 30° 00′ W. Current, 18 miles, N. W. Variation, 11° W. Barometer, 29.40; temperature of air, 81°; of water, 80°. Winds: east, east, and N. E. Pleasant breezes, all sail set. I think I have shortened my passage to the equator ten days by following Maury's Directions, or Chart.

Feb. 3. Lat. 00° 15′ N.; long. 30° 10′ W. Current, 20 miles, W. N. W. Barometer, 29.40; temperature of air, 81°. Winds: east, N. N. E., and E. by N. Pleasant breezes.

Feb. 4. Lat. 1° 25′ S.; long. 31° 00′ W. Current, 15 miles, west. Variation, 8° W. Temperature of air, 80°; of water, 81°. Winds: E. S. E., S. E., and S. E. by S. First part, light breezes; middle part, heavy squall; latter part, fresh.

Feb. 5. Lat. 3° 20′ S.; long. 32° 05′ W. Current, 15 miles, west. Barometer, 29.40; temperature of air, 80°; of water, 81°. Wind: S. E. by S. throughout; pleasant breezes.

Feb. 6. Lat. 5° 45′ S.; long. 33° 05′ W. Barometer, 29.40; temperature of air, 81°; of water, 81°. Wind: S. E. by E.; pleasant breezes. At 6 P. M. passed the Island of Fernando de Noronha, about 6 miles to leeward of it.

Ship Masconoma (A. D. Cobb), Boston to San Francisco, 21 days out.

Jan. 27, 1853. Lat. 19° 18′ N.; long. 31° 11′ W. Current per hour, three-quarter knot, south. Barometer, 29.00; temperature of air, 68°; of water, 73°. Winds: east; variable, E. by S. Strong winds, with heavy squalls in middle part.

Jan. 28. Lat. 17° 17′ N.; long. 29° 22′ W. Current, three-quarter knot, S. W. Barometer, 29.00; temperature of air, 70°; of water, 72°. Winds: E. by S., E. N. E., E. N. E. First part, strong winds, with frequent rain squalls; middle and latter parts, steady breezes, with fine weather.

Jan. 29. Lat. 16° 15′ N.; long. 28° 13′ W. Barometer, 29.50; temperature of air, 72°; of water, 73°. Winds: E. by N., east, E. by N. Moderate breezes.

Jan. 30. Lat. 14° 07′ N.; long. 27° 22′ W. Current, half knot, S. S. E. Barometer, 30.00; tempera-

ture of air, 73°; of water, 73°. Winds: E. by N., east, do. First part, light variable airs; middle, moderate; latter, strong winds, with a heavy N. E. swell. Saw a number of sperm whales.

Jan. 31. Lat. 11° 34′ N.; long. 25° 35′ W. Barometer, 30.00; temperature of air, 72°; of water, 75°. Winds: E., E. by N., E. by N.; strong wind and cloudy, with passing squalls.

Feb. 1. Lat. 8° 39′ N.; long. 23° 45′ W. Barometer, 29.00; temperature of air, 75°; of water, 77°. Winds: E. by N., E. by N., E. N. E.; first part, strong breezes and cloudy; middle, light, with rain squalls; latter, fine breezes; pleasant weather.

Feb. 2. Lat. 5° 55′ N.; long. 23° 13′ W. Current, ½ knot, S. Barometer, 28.50; temperature of air, 77°; of water, 78°. Winds: E. N. E., E. N. E., E. N. E.; pleasant breezes.

Feb. 3. Lat. 4° 29′ N.; long. 22° 42′ W. Current, ½ knot, S. S. E. Barometer, 28.50; temperature of air, 78°; of water, 78°. Winds: N. E., E. by S., N. E.; light winds, and pleasant.

Feb. 4. Lat. 3° 38′ N.; long. 22° 15′ W. Barometer, 28.00; temperature of air, 78°; of water, 80°. Winds: N. N. E., S. E., S.; first part, light winds, and cloudy; middle and latter, light, variable winds, with rain.

Feb. 5. Lat. 3° 13′ N.; long. 22° 25′ W. Barometer, 28.00; temperature of air, 78°; of water, 80°. Winds: N. by E., N. E., E.; light and variable rain, *thunder and lightning.*

Feb. 6. Lat. 2° 39′ N.; long. 22° 35′ W. Barometer, 28.00; temperature of air, 78°; of water, 80°. Winds: N. N. E., S. E., N. E.; wind and weather, the same as yesterday.

Feb. 7. Lat. 1° 55′ N.; long. 22° 47′ W. Barometer, 28.00; temperature of air, 78°; of water 79°. Winds: N. N. E., E., N. N. E.; light and variable, and calm; abundance of rain.

Feb. 8. Lat. 1° 44′ N.; long. 22° 47′ W. Current, 1 knot, N. N. E. Barometer, 28.82; temperature of air, 78°; of water, 79°. Winds: E., N. W., S. W. by S.; light airs, and calm. Having good observations find a N. E. current during the last four days, but owing to unsteadiness of winds, cannot determine the amount.

Feb. 9. Lat. 1° 26′ N.; long. 23° 10′ W. Current, ¾ knot, N. W. Barometer, 28.82; temperature of air, 75°; of water, 79°. Winds: S. S. W., S., S. by W.; light baffling airs, and clear.

Feb. 10. Lat. 0° 37′ N.; long. 24° 57′ W. Current, 1 knot, W. Barometer, 28.83; temperature of air, 78°; water, 78°. Winds: S., S. by E., S. by E.; light wind, and fine weather.

Feb. 11. Lat. 0° 38′ S.; long. 25° 25′ W. Current, ½ knot, S. W. Barometer, 29.00; temperature of air, 78°; of water, 79°. Winds: S. S. E., S. E. by E., S. E. by E.; first and middle parts light wind, latter part calm.

Feb. 12. Lat. 1° 39′ S.; long. 26° 42′ W. Current, ¾ knot, S. W. Barometer, 29.00; temperature of air, 80°; of water, 81°. Winds: S. E. by S., S. by E., S. by E.; light wind, and pleasant.

Feb. 13. Lat. 2° 47′ S.; long. 28° 22′ W. Barometer, 28.90; temperature of air, 81°; of water, 81°. Winds: S. by W., S. by W., S. by E.; light winds and pleasant. I find the *old route* bad; shall try the new next time. [We are determined to purchase this conclusion by your own experience.]

Feb. 14. Lat. 4° 9′ S.; long. 29° 12′ W. Barometer, 28.85; temperature of air, 81°; water, 81°.

Winds: S., S. by E., S. S. E.; light winds and fine weather. Barometer rises and falls about $\frac{5}{10}$ since we passed 6° N.; rising in the morning and falling about 4 or 5 P. M. [See what Roberts, of the Storm, p. 346, says about it in north lat.]

New York to Rio.—FEBRUARY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From 40° 27′ N.	74° 00′ W.	to									
39 11	70 00	E. S. E.	199	5.1	209	1.3	7.3	5.9	85.5	6.2	303
37 33	65 00	E. S. E.	256	2.7	263	0.0	5.7	2.3	92.0	4.5	87
35 53	60 00	E. S. E.	263	1.2	280	7.0	9.0	6.0	84.0	1.0	100
35 53	55 00 *d*	E.	243	7.2	260	3.0	5.0	4.0	88.0	1.0	100
35 00	53 12	E. S. E.	144	5.7	151	1.3	12.2	14.8	78.4	4.0	74
33 21	50 00	S. E.	225	0.0	225	0.0	0.0	0.0	100.0	3.5	28
32 54	48 13	E. S. E.	98	2.1	100	0.0	5.5	5.5	88.9	0.0	18
30 00	45 00	S. E.	240	3.8	249	0.0	5.5	11.1	83.4	0.0	18
25 38	40 00 *d*	S. E.	372	0.0	372	0.0	0.0	0.0	100.0	0.0	20
25 00	40 00	S.	38	11.5	42	3.7	14.8	7.4	74.1	18.2 *e*	27
20 00	37 45	S. S. E.	324	9.3	354	4.8	1.6	3.2	90.3	3.1	62
15 00	35 35	S. S. E.	324	1.6	329	0.0	*w* 8.0	0.0	92.0	0.0	25
10 00	33 28	S. S. E.	324	0.0	324	0.0	0.0	0.0	100.0	0.0	31
5 00	31 23 *d*	S. S. E.	324	0.0	324	0.0	0.0	0.0	100.0	5.3 *e*	18
Equator	31 23 *d*	S.	300	3.7	311	0.0	*w* 14.7	0.0	85.3	2.7	108
1 00 S.	32 00	S. S. W. ¾ W.	72	5.1	76	0.0	*w* 19.0	0.0	81.0	1.7	289
3 00	32 50	S. S. W.	130	6.5	138	0.0	*w* 21.6	0.0	78.4	0.0	28
3 24	33 00	S. S. W.	26	0.0	26	0.0		0.0	100.0	0.0	9
5 00	33 40	S. S. W.	104	3.0	107	0.0	*w* 25.0	0.0	75.0	0.0	12
7 00	33 40 *d*	S.	120	0.0	110	0.0	0.0	0.0	100.0	0.0	11
7 48	34 00	S. S. W.	52	0.0	52	0.0	0.0	0.0	100.0	0.0	22
9 00	34 30	S. S. W.	78	5.2	82	0.0	*w* 13.0	0.0	87.0	0.0	23

Shortest distance to the equator by this route, 3,674 miles. Average distance to be sailed on account of adverse winds, 3,793.

The route for this month is the most favorable. In no part of it is the average of winds that are entirely fair, less than 74 in 100; and generally the northern or larboard side is the windward side. The passage to the line has been frequently made by vessels that have followed this route, in 19 and 20 days, and even in 17 days.

Ship Lucknow (D. Plumer), Boston to California, fourteen days out.

January 29, 1853. Lat. 19° 59′ N.; long. 35° 22′ W. Barometer, 30.00; temperature of air, 74°; of water, 76°. Winds: E. by N., east, E. by S. Brisk trade-winds, and cloudy, with occasional rain squalls, during which the wind invariably hauls two or three points to the S. E. Barometer at a stand.

Jan. 30. Lat. 16° 11′ N.; long 34° 18′ W. Barometer, 30.00; temperature of air, 72°; of water, 75°.

Winds: E. by S., baffling, in squalls to S. E., throughout. Brisk breezes, and cloudy with frequent squalls from S. E., and showers of rain throughout.

Jan. 31. Lat. 13° 05′ N.; long. 33° 21′ W. Barometer, 30.00; temperature of air, 73°; of water, 76°. Winds: E. by S., E. by S., east; first and middle parts, strong breezes, with frequent squalls; latter part, fresh breezes and pleasant. Saw an unusual number of flying-fish.

Feb. 1. Lat. 10° 06′ N.; long. 31° 50′ W. Current 10 miles, east. Barometer, 29.92; temperature of air 76°; water 79°. Wind east. Fine breezes and cloudy, with occasional light showers.

Feb. 2. Lat. 7° 19′ N.; long. 29° 46′ W. Barometer, 29.90; temperature of air, 78°; of water, 79°. Wind E. by N.; fine trades and hazy; strong tide rips at times, but found no current.

Feb. 3. Lat. 4° 34′ N.; long 28° 04′ W. Current, 24 miles, S. 42° E. Barometer, 29.86; temperature of air, 80°; of water 81°. Wind E. by N. Light trades, and pleasant; sea unusually smooth; some tide rips.

Feb. 4. Lat. 2° 55′ N.; long. 28° 01′ W. Barometer, 29.85; temperature of air, 81°; of water, 81°. Winds: E. by S., E. S. E. by S. Light air from east to S. S. E; baffling, with calms, and light rain squalls.

Feb. 5. Lat. 1° 31′ N.; long. 28° 39′ W. Current, 27 miles N., 57° E. Barometer, 29.84; temperature of air, 82°; of water, 81°. Winds: S. E. by S., S. E. by S., S. S. E. Light airs from S. E. to S. S. E. and pleasant; sea very smooth.

Feb. 6. Lat. 0° 06′ N.; long 30° 33′ W. Current, 15 miles, west. Barometer, 29.62; temperature of air, 81°; of water, 80°. Winds: S. S. E., S. S. E., S. by E. Light airs from S. S. E., and pleasant, first and middle parts. At midnight, being, by account, up with St. Paul's, and having the water unusually smooth, suppose we passed to leeward of it, very near; but, being rather hazy, saw nothing. Latter part, brisk breezes, and pleasant, but a little too far to the southward to suit me; but I trust the wind will be a little farther to the eastward before long. Strong tide rips through the night.

Feb. 7. Lat. 1° 07′ S.; long. 31° 32′ W. Barometer, 29.84; temperature of air, 81°; of water, 80°. Winds: southward, east, S. by E., S. by E., south and S. S. E. Moderate breezes, and pleasant. At 1 hour 30 min. P. M. crossed the equator, just 22 days from Boston Light, on the meridian of 30° 40′ W., having sailed, by log, 3,803 miles, and courses made good, 3,782. [No other circumstance, not even the actual performance of the passage within a given time, tends so strikingly to prove the correctness of the data upon which these Charts are founded, and the accuracy of the calculations derived from them, as the near coincidence here referred to. Taking into account the detour which a ship has to make on account of head winds, the distance to be sailed is calculated. The Lucknow tries it, and her distance sailed differs only 10 miles from the computed distance.] At 8 tacked to the eastward, and at noon to S. W.

Feb. 8. Lat. 2° 37′ S.; long. 32° 33′ W. Barometer, 29.82; temperature of air, 82°; of water, 81°. Wind: S. S. E. Light airs from S. by E. to S. E.; standing to the southward and westward; weather fine, and sea smooth.

Feb. 9. Lat. 4° 16′ S.; long. 33° 24′ W. Current, 20 miles S., 62° W. Barometer, 29.87; temperature of air, 81°; of water, 81°. Winds: S. E., S. E. by E., S. E. Light airs throughout, with the

exception of a brisk breeze for an hour or two after sunrise. Passed the Roccas without seeing them, but saw thousands of birds which I have noticed before in this vicinity.

Barque Falcon (John A. Phipps), Boston to Canton, thirteen days out.

Jan. 28, 1852. Lat. 26° 45′ N.; long. 42° 22′ W. Current, one mile per hour, N. N. W. ½ W. Barometer, 30.40; temperature of air, 72°; of water, 72°. Winds: E. S. E. squally, the wind flying from S. E. to E. by S. I had rather take my chance on the N. E. tack at present; if it was winter, I should think otherwise.

Jan. 29. Lat. 28° 14′ N.; long. 41° 26′ W. Current, one-quarter of a knot per hour, W. ½ S. Barometer, 30.50; temperature of air, 70°; of water, 71°. Winds: E. S. E., S. E., S. E. by E.; strong breezes and hard squalls; wind hauling from S. S. E. to E. S. E. with a high sharp sea. I have been eighteen years master of a ship in about this same track, and never experienced the like before.

Jan. 30. Lat. 29° 56′ N.; long. 39° 42′ W. Current, one knot per hour, N. W. Barometer, 30.45; temperature of air, 69°; of water, 68°. Winds: E. S. E., E. S. E., S. S. E.; begins good breezes and the same squalls of wind.

Jan. 31. Lat. 30° 10′ N.; long. 38° 32′ W. Current, three-quarters of a knot per hour, N. W. by W. Barometer, 30.45; temperature of air, 68°; of water, 68°. Winds: S. S. E., south, S. by W.; during these twenty-four hours unsteady, with some squalls.

Feb. 1. Lat. 30° 29′ N.; long. 37° 36′ W. Current, three-quarters of a knot per hour, north. Barometer, 30.45; temperature of air, 68°; of water, 69°. Winds: S. S. E., south, calm; baffling winds and very light airs; some calms. I have been both sides of the January track, and find it all alike this time.

Feb. 2. Lat. 30° 22′ N.; long. 37° 39′ W. No current. Barometer, 30.40; temperature of air, 69°; of water, 69°. Winds: calm, calm, E. S. E.; first and middle parts calm, with a high swell; ends with light airs. I made up my mind to try your track this time; have been on it, to the westward and eastward of it, and have made up my mind that the old and new are all alike just now. Bad luck follows me so far.

Feb .3. Lat. 27° 47′ N.; long. (D. R.) 37° 53′ W. Barometer, 30.40; temperature of air, 68°; of water, 69°. Winds: S. E., S. E., S. E.; strong winds and hard squalls; hard luck this.

Feb. 4. Lat. 24° 53′ N.; long. 38° 21′ W. Barometer, 30.40; temperature of air, 71°; of water, 72°. Winds: S. S. E., S. E., S. E.; brisk breezes with some squalls; all sails set.

Feb. 5. Lat. 21.° 53′ N.; long. 37° 27′ W. Current, W. N. W., three quarters of a knot per hour. Barometer, 30.35; temperature of air, 72°; of water, 72°. Winds: E. S. E., E. by S., E. S. E.; strong breezes and squally; close hauled by the wind; baffling in squalls.

Feb. 6. Lat. 18° 37′ N.; long. 36° 13′ W. Current none. Barometer, 30.30; temperature of air, 73°; of water, 72°. Winds: E. S. E., E. by S., E. by S.; strong winds and flawy; sharp on a wind.

Feb. 7. Lat. 15° 19′ N.; long. 34° 41′ W. Barometer, 30.25; temperature of air, 73°; of water, 74°.

Wind: E. by S.; first and middle parts, strong breezes; latter part, more moderate. Passed through several tide rips.

Feb. 8. Lat. 12° 19′ N.; long. 33° 21′ W. Current, W. ½ N., 1½ knots. Barometer, 30.20; temperature of air, 74°; of water, 75°. Winds: E., E. ½ S., E. by S.,; brisk breezes and hazy.

Feb. 9. Lat. 9° 30′ N.; long. 31° 37′ W. Current, N., ¾ knot. Barometer, 30.20; temperature of air, 75°; of water, 76°. Wind: good breezes and hazy.

Feb. 10. Lat. 6° 59′ N.; long. 29° 16′ W. Barometer, 30.10; temperature of air, 76; of water, 77°. Winds: E., E. by N., E. by N.; brisk breezes, all sail set by the wind.

Feb. 11. Lat. 4° 24′ N.; long. 27° 30′ W. Current, N., ¾ of a knot. Barometer, 30.01; temperature of air, 78°; of water, 78. Wind: E. N. E.; fine breezes. This day is the first of the N. E. trades with any northing in it. [You should have made a south course good.]

Feb. 12. Lat. 1° 24′ N.; long. 26° 46′ W. Current, N. W., ½ knot per hour. Barometer, 30.10; temperature of air, 79°; of water, 80°. Winds: E. by N., E., E.; fine breezes.

Feb. 13. Lat. (D. R.) 00° 24′ N.; long. 26° 40′ W. Barometer, 30.10; temperature of air, 79°; of water, 80°. Winds: E., S. E., S. E. At 2 P. M. lost the trade-wind; remainder of the day light airs and variable. [29 days to the line, is not so bad, after all.]

Feb. 14. Lat. 01° 10′ S.; long. 27° 37′ W. Current, S. S. W., 1 knot. Barometer, 30.10; temperature of air, 81°; of water, 80°. Wind variable from E. N. E. to S. by E.; light baffling winds, calm at times. [The chances are, that, further west, you would have escaped those calms, to a considerable degree at least.]

Ship Astrea (Charles H. Gerrish), New York to San Francisco, 1853, 25 days out.

Jan. 27. Lat. 20° 19′ N.; long. 31° 53′ W. Current, S. 22° E., ½ knot per hour. Variation, 12° 45′ W. Barometer, 29.7; temperature of air, 73° of water, 73°. Winds: E. N. E., E., E. N. E.; first part, fresh gales thick and squally; middle, more moderate; latter, strong breezes and squally.

Jan. 28. Lat. 17° 40′ N.; long. 31° 02′ W. Barometer, 29.06; temperature of air, 73°; of water, 75°. Winds: E. by N., E. N. E., E. N. E.

Jan. 29. Lat. 16° 27′ N.; long. 30° 31′ W. Barometer, 29.7; temperature of air, 74°; of water, 74°. Winds: E. N. E., E. by S., E. by N.; first part, moderate steady trades; middle and latter, clear and pleasant.

Jan. 30. Lat. 14° 10′ N.; long. 30° 04′ W. Barometer, 29.7; temperature of air, 74°; of water, 74°. Winds: E. N. E., E. S. E., E. N. E.; first part moderate; middle and latter, thick and squally.

Jan. 31. Lat. 11° 20′ N.; long. 29° 5′ W. Variation, 9° 57′ W. Barometer, 29.60; temperature of air, 76°; of water, 76° Winds: E. by N., E. N. E., E. N. E.; fresh gales and squally throughout.

Feb. 1. Lat. 8° 45′ N.; long. 28° W. Barometer, 29.60; temperature of air, 77°; of water, 79°. Winds: E., E. N. E., and E. N. E.; first part, fresh gales and cloudy, squally weather; middle and latter part, sharp squall; under double reefs.

Feb. 2. Lat. 6° 30′ N.; long. 27° 4′ W. Barometer, 29.60; temperature of air, 79°; of water, 80°. Wind: E. N. E.; first part, strong breezes and cloudy; middle and latter part, moderate and pleasant.

Feb. 3. Lat. 4° 22′ N.; long. 26° 43′ W. Barometer, 29.60; temperature of air, 79°; of water, 80°; Winds: east, E. by S., and east; pleasant breezes and clear weather.

Feb. 4. Lat. 3° 29′ N.; long. 26° 34′ W. Barometer, 29.60; temperature of air, 79°; of water, 80°. Winds: east, southerly, S. E.; all sorts of wind and weather, with rain during the latter part.

Feb. 5. Lat. 3° 9′ N.; long. 26° 40′ W. Barometer, 29.60; variation, 8° W.; temperature of air, 79°; of water, 80°. Winds: S. E., S. S. E., E. N. E.; light airs, and thick squally weather; middle part, rain.

Feb. 6. Lat. 2° 12′ N.; long. 26° 45′ W. Barometer, 29.60; temperature of air, 81°; of water, 80°. Winds: E. by N., S. E., S. S. E.; light breezes, and thick cloudy weather.

Feb. 7. No observation. Barometer, 29.60; temperature of air, 80°; of water, 80°. Winds: S. E., south, and S. S. E.; light variable airs and calms, with thick, rainy weather.

Feb. 8. Lat. 1° 46′ N.; long. 27° 14′ W. Barometer, 29.50; temperature of air, 82°; of water, 81°. Winds: south, calm, S. S. W.; light variable airs and calms, with rainy weather.

Feb. 9. No observation. Current, S. 45° E., 12 miles. Barometer, 29.50; temperature of air, 81°; of water, 80°. Winds: south, S. S. E., and S. E.; first part, light airs and calms, and cloudy. Lowered a boat to try the current, and found it to be as mentioned above.

Feb. 10. Lat. 1° N.; long. 27° 50′ W. Current, 10 miles, N. W. Barometer, 29.50; temperature of air, 82°; of water, 80. Winds: S. S. E., S. E., S. E.; light airs and pleasant weather. Tried the current again with a boat. This satisfies me that there is a current hereabout that changes its set as often as once in 24 hours. "I have frequently noticed, when lying becalmed for two or three days at a time, within two or three days north and south of the line, and east of long. 30° W., that the ship would be set from 10 to 20 miles N. W. one day, and the next day as many miles to the S. and E." I have also noticed a strong easterly current to the E. of 24° 30′ west longitude, but never noticed any westerly set there. Ends pleasant.

Feb. 11. Lat. 18′ N.; long. 27° 52′ W. Barometer, 29.60; temperature of air, 82°; of water, 80°. Winds: S. E., S. E. by S., S. E.; light variable airs, and pleasant.

Compare this with the Lucknow, p. 365. She was from New York also, but she had 14 days to the parallel of 20° N., which she crossed 3½ degrees west of where the Astrea crossed it. From this parallel to the equator, the western ship had 8, the eastern 15 days. Now compare their tracks with the route per table for February, and see which of the two were following most closely the Sailing Directions.

Feb. 12. Lat. 35′ S.; long. 28° 6′ W. Barometer, 28.50; temperature of air, 84°; of water, 83°. Winds: S. E., S. S. E., and south; light, variable airs, and pleasant. Crossed the equator at 2 A. M., in longitude 28° W.

Feb. 13. Lat. 00° 24′ S.; long. 27° 57′ W. Barometer, 29.50; temperature of air, 83°; of water, 82°. Winds: S., S. S. E., and S.; light, variable airs, and pleasant. Current N. 45° E., 24 miles.

Feb. 14. Lat. 00° 27′ S.; long. 27° 41′. Barometer, 29.50; temperature of air, 82°; of water, 84°. Winds: S. S. W., and S. E.; light, variable airs, and pleasant. Current S. 67° E., 24 miles.

Feb. 15. Lat. 0° 52′ S.; long. 27° 22′ W. Barometer, 29.50. Current S. 45° E., 48 miles; temperature of air, 82°; of water, 81°. Winds: S. E., E. S. E., and S. E.; light breezes and pleasant.

Feb. 16. Lat. 2° 16′ S.; long. 28° 33′ W. Current N. 36° W., 36 miles; variation, 6° 45′ W. Barometer, 29.60; temperature of air and water, 81°. Winds: S. E., S. S. E., and S. E.; light breezes; first part, pleasant; latter part, cloudy.

Feb. 17. Lat. 4° 32′ S.; long. 29° 21′ W. Barometer, 29.60; temperature of air, 82°; of water, 80°. Winds: S., S. S. E., S. E.; fresh breezes and flying clouds.

Feb. 18. Lat. 6° 36′ S.; long. 29° 59′ W. Barometer, 29.60; temperature of air, 82°; of water, 81°. Winds: S. E., E. by S., S. E.; fresh breezes, and pleasant.

Ship Simoom (M. Smith), New York to San Francisco, ten days out.

Feb. 4, 1853. Lat. 25° 56′ N.; long. 36° 57′ W. Barometer, 29.80; temperature of air, 82°; of water, 82°. Winds: S. E., S. S. E., S. S. E. Commences moderate and showery; latter part, fresh breezes, and squally. At 3 A. M. a brilliant meteor in the east fell from 50° to 15°, visible; a quantity of sea-weed hanging from S. E. to N. W. N. B. From the 22d ult. to the 1st inst. (that is, from the Bermudas to 350 miles S. by W. of the Azores), 11 days, we had the wind from S. S. E. to S. S. W.; and, in the forenoon, it generally inclined two or three points to the eastward; in the afternoon it changed back. I recollect the last few years (in the Niagara, running to Liverpool), while S. and S. E. of Newfoundland in the summer, it would veer around the compass with the sun, once in 24 hours, for four or five days.

Feb. 5. Lat. 23° 09′ N.; long. 39° 17′ W. Barometer, 29.70; temperature of air, 77°; of water, 73°. Wind: S. S. E. throughout; frequent rain squalls in the night, severe.

Feb. 6. Lat. 21° 17′ N.; long. 41° 17′ W. Barometer, 29.90; temperature of air, 78°; of water, 77°. Winds: S. S. E., S. S. W., S.; squally.

Feb. 7. Lat. 19° 35′ N.; long. 44° 41′ W. Barometer, 29.70; temperature of air, 80°; of water, 77°. Wind south throughout, moderate and cloudy. At 4 P. M. sharp lightning in the west. At noon, tacked ship.

Feb. 8. Lat. 17° 10′ N.; long. 45° 25′ W. Barometer, 29.75; temperature of air, 80°.5; of water, 78°. Winds: S. S. E. to east, S. E., do.; moderate and variable; midnight, fresh; ends light. At 5 P. M. tacked to the southward.

Feb. 9. Lat. 14° 04′ N.; long. 44° 26′ W. Barometer, 29.70; temperature of air, 78°; of water, 78°. Winds: E. S. E., E., do.; moderate and squally; in the evening the trade-wind commenced. I have, at no time, had so much southwesterly wind before this; according to your Charts it ought to be N. E., but it is barely east.

Feb. 10. Lat. 11° 40′ N.; long. 43° 27′ W. Barometer, 29.70; temperature of air, 82°; of water, 78°. Wind east throughout. Commences fresh breezes, cloudy, and hazy. Morning, cleared off. 8 A. M., tack to the northward.

Feb. 11. Lat. 10° 38′ N.; long. 42° 23′ W. Barometer, 29.70; temperature of air, 79°; of water, 78°. Wind east throughout. Moderate and pleasant; tacked south.

Feb. 12. Lat. 8° 12′ N.; long. 40° 15′ W. Barometer, 29.70; temperature of air, 80°; of water, 78°. Winds: E., E. N. E., E. N. E. First part, pleasant; latter, squally.

Feb. 13. Lat. 5° 29′ N.; long. 27° 43′ W. Barometer, 29.65; temperature of air, 82°; of water, 78°. Winds: E. N. E., variable, E. N. E., east, variable. Commences fresh and squally. The upper strata of clouds are passing to the east by the sun; ends light and cloudy.

Feb. 14. Lat. 4° 04′ N.; long. 36° 53′ W. Barometer, 29.65; temperature of air, 81°; of water, 78°. Winds: east, S. S. E., variable, east. Moderate and showers. Midnight, tacked to the east. At 5 A. M. to S. S. E.; ends light, with passing clouds.

Feb. 15. Lat. 2° 58′ N.; long. 44° 57′ W. Temperature of water, 79°. Winds: S. E., E. N. E., N. E. First part, light air; ends light N. E. breezes.

Feb. 16. Lat. 1° 51′ N.; long. 34° 27′ W. Barometer, 29.70; temperature of air, 88°; of water, 82°. of water (ten feet below surface), 81°. Winds: N. E., calm, S. E., S. E. First part, light N. E. wind; midnight, calm; latter, light S. E.; so we passed from the N. E. to the S. E. trades last night.

Feb. 17. Lat. 1° 01′ N.; long. 34° 28′ W. Barometer, 29.65; temperature of air, 87°. Winds: S. E. inclining south, S. E. by S., S. E. by S. to S. E. by E. Commences light and pleasant. At 8 P. M., broke off to S. W. westerly, tacked. At 4 A. M. inclining eastwardly, tacked to S. by W.; ends fresh and cloudy.

Feb. 18. Lat. 1° 15′ S.; long. 35° 03′ W. Barometer, 29.60; temperature of air, 86°. Winds: E. S. E., E. S. E., S. E. Forepart, fresh. At 8 P. M. flash of lightning E. by N., which, at midnight, passed north of us with a squall; ends light and cloudy; passed the equator at 9 P. M., in 34° 40′, 29 days out, from N. E. of Bermudas 26, with a constant head wind.

Feb. 19. Lat. 0° 11′ S.; long. 34° 07′ W. Barometer, 29.70; temperature of air, 83°; of water (ten feet below surface), 81°. Winds: S. E., E. S. E., E. S. E. Moderate and cloudy. At 30 min. P. M. tacked to E. N. E. Forepart of the night, sheet lightning at the N. E. and N.; ends moderate and cloudy. At 11 A. M. tacked to S. S. W.

Feb. 20. Lat. 3° 31′ S.; long. 35° 48′ W. Barometer, 29.55; temperature of air, 84°. Wind: S. E. by S. throughout. Fresh breezes and cloudy; running ten and a half to eleven and a half knots during the night; yards very sharp up; are 70 miles from land, and shall fall 60 to leeward of Point Tairo; then for the race, whether the Simoom or Cape St. Roque can beat fastest to windward; this makes the 29th day of head winds.

Feb. 21. Lat. 4° 50′ S.; long. 36° 15′ W. Barometer, 29.10; temperature of air, 83°; of water (ten feet below surface), 80°. Wind east throughout; fresh winds, inclining more to the north when nearing;

tacked to the north at 7 P. M., to the S. S. E. at 3 A. M., to the north at 11 hours 45 min. A. M.; close to the breakers, W. N. W. from Point Tairo. Current, one and a half miles per hour, W. N. W.

Feb. 22. Lat. 3° 38′ S.; long. 35° 48′ W. Barometer, 29.65; temperature of air, 84°; of water (ten feet below surface), 81°. Winds: E., E. S. E., E. S. E.; forepart, fresh; night, light sheet lightning in the south over the land; working ahead slowly along the land; ends with light breezes.

Feb. 23. Lat. 3° 05′ S.; long. 34° 36′ W. Current, five-sixth of a mile per hour, west. Barometer, 29° 75′; temperature of air, 87°. Wind: S. E. throughout; first, fresh and clear; working to the eastward. At midnight, a white meteor with red flashes, "not large," passed rapidly with the horizon, in the S. E. sky, 25° high, 45° in a N. E. direction; ends hazy.

Feb. 24. Lat. 2° 07′ S.; long. 33° 31′ W. Current, thirty-six miles W., 14° N. Barometer, 29.65; temperature of air, 86°. Wind: S. E.; moderate and smoky, with passing clouds; towards morning, light and squally; at 8 A. M. tacked to S. S. W.

Feb. 25. Lat. 5° 11′ S.; long. 34° 39′ W. Current, N. 12° W., six-tenths of a mile per hour. Barometer, 29.66; temperature of air, 85°. Winds: S. E., do., S. S. E.; moderate and pleasant; have weathered Cape St. Roque after four days' hard beating.

Feb. 26. Lat. 6° 40′ S.; long. 34° 29′ W. Current (per hour), five tenths of a mile N., 11° W. Barometer, 29.65; temperature of air, 83°. Winds: S. E., E. S. E., S. E.; fresh and pleasant; at 5 P. M. tacked to N. E. off Rio Grande del Norte; at ten, back again, and at 11.25 to N. E. in ten fathoms water; light airs.

Feb. 27. Lat. 7° 06′ S.; long. 34° 27′ W. Barometer, 29.70; temperature of air, 84°. Winds: S. E; light and variable; working along in from ten to fifteen fathoms water; at noon, light wind at N. E.; the first, since by Bermuda, 35 days; three-fourths of that time it has been straight ahead. Has ever any one had it so contrary before, in January and February? Have made 350 miles the last nine days; At 10 P. M. lightning to the W. S. W. over the land.

Bad luck you certainly had. But, notwithstanding you fell so far to leeward, and "the time" you had of it, in weathering St Roque, compare your track with the Astrea's (p. 368). She crossed 30° N. in 26° 40′ W., and had thence thirteen days to 6° S. You crossed 3° N. in 35°, fell *far* to leeward, yet you crossed 6° S. two days ahead of the Astrea.

Rio de Janeiro, *March* 22, 1853.

I herewith forward the abstract log of the ship Wings of the Morning, from New York to the port of Rio. On the 27th of January, the fifth day from New York, you will perceive that I carried away the main truss and wings of the main yard, together with the main topmast and all three top gallant-masts and jib-boom. For several days after, we had no sail except the fore and mizzen topsails, foresail, and spanker. From that time, to sixteen north, with two days' exception, we had the winds principally from south to southwest. Much of the time blowing fresh gales. Consequently, I was driven far to the eastward of the

ship's intended course. From the time the ship lost her spars until I crossed the equator, without one exception, stood on the tack I could make the most latitude. We carried the N. E. trade to five, and took the wind S. S. E. in 2° N. Crossed the line in twenty-eight, and passed out of sight to windward of Noronha. The trades, both north and south, were very light. Your *very, very* valuable Sailing Directions and Charts I consider the best guide ever given to the navigator for pointing out the way to shorten the passage between New York and Rio, when it is practicable to follow them. The abstract of the remaining passages during the voyage, will be forwarded from the different ports on my arrival.

Very respectfully yours,

H. H. LOVELL.

LIEUT. M. F. MAURY.

Ship Wings of the Morning (H. H. Lovell), New York, bound to San Francisco, 1853, twenty-two days out.

Feb. 14, 1853. Lat. 30° 08′ N.; long. 36° 48′ W. Barometer, 29.70; temperature of air, 68°. Winds: N. N. E., N. E., N. E.

Feb. 15. Lat. 27° 00′ N.; long. 36° 30′ W. Barometer, 28.0; temperature of air, 68°. Winds: E., S. E., S. E. by S.

Feb. 16. No observations. Barometer, 29.70. Winds: S., S. S. W., S. W. by S. Squally, with rain.

Feb. 17. Lat. 25° 43′ N.; long. 33° 30′ W. Barometer, 29.70. Winds: S. S. W. Ship under single reefs; squally.

Feb. 18. Lat. 24° 44′ N.; no observation for longitude. Barometer, 29.8. Winds: S. S. W., S. by W., S. W. Weather unsettled; single reefs.

Feb. 19. Lat. 23° 09′ N.; long. 29° 43′ W. Barometer, 29.9. Winds: S. S. W., S. W., S. by W. Squalls and rain throughout the day.

Feb. 20. Lat. 21° 50′ N.; long. 27° 28′ W. Barometer, 29.90. Winds: S. S. W., S. W., W. S. W. Weather unsettled, rainy, and squally.

Feb. 21. Lat. 20° 00′ N.; long. 27° 08′ W. Barometer, 29.9. Winds: S. W., W. S. W., W. S. W. Changeable weather.

Feb. 22. Lat. 18° 33′ N.; long. 27° 08′ W. Barometer, 29.9; temperature of air, 68°. Winds: W. S. W., calm, W. Cloudy, with rain, thunder, and lightning.

Feb. 23. Lat. 17° 12′ N.; long. 27° 08′ W. Barometer, 30.00; temperature of air, 70°. Winds: W. S. W., calm E. N. E.

Feb. 24. Lat. 14° 27′ N.; long. 27° 13′ W. Barometer, 30.00; temperature of air, 70°. Winds: E., E. N. E., E. N. E. All sail set.

Feb. 25. Lat. 11° 57′ N.; long. 27° 13′ W. Barometer, 30.00. Winds: E., E. N. E., E. N. E. All sail set.

Feb. 26. Lat. 10° 05′ N.; long. 26° 40′ W. Barometer, 30.00. Wind: N. E.; ½ knot per hour, easterly current.

Feb. 27. Lat. 8° 51′ N.; long. 26° 40′ W. Barometer, 30.00; temperature of air, 72°. Winds: N. by E., N. by E., N. E. A slight easterly current; winds very light.

Feb. 28. Lat. 7° 03′ N.; long. 26° 40′ W. Barometer, 30.00; temperature of air, 78°. Winds: N. N. E., N. N. E., N. E. Light breezes and cloudy.

March 1. Lat. 4° 30′ N.; long. 26° 40′ W. Current, ½ of a knot, east. Barometer, 30.00; temperature of air, 80°. Wind: N. N. E. Weather cloudy.

March 2. Lat. 3° 20′ N.; long. 26° 31′ W. Barometer, 30.00; temperature of air, 80°. Winds: N., N. N. W., S. W. Weather changeable.

March 3. Lat. 2° 04′ N.; long. 26° 30′ W. Barometer, 30.00; temperature of air, 80°. Winds: N. W., N., S. E. Rain.

March 4. Lat. 1° 06′ N.; long. 26° 31′ W. Barometer, 30.00; temperature of air, 80°. Winds: N., calm, S. E. Heavy looking squalls, but unattended with wind, and much rain.

March 5. Lat. 00° 55′ S.; long. 28° 22′ W. Barometer, 30.00; temperature of air, 81°. Winds: S. S. E., S., S. S. E. Pleasant weather.

March 6. Lat. 3° 20′ S.; long. 30° 00′ W. Current, ½ knot per hour, W. Barometer, 30.00; temperature of air, 82°. Wind: S. S. E.

March 7. Lat. 5° 27′ S.; long. 31° 34′ W. Current, same as yesterday. Barometer, 30.00; temperature of air, 82°. Winds: S. S. E., S. E., S. E. Light airs.

March 8. Lat. 7° 31′ S.; long. 31° 50′ W. Barometer, 29.9; temperature of air, 82°. Winds: S. E. E., E. Pleasant; all sail.

Golden Racer (B. M. Melcher), Boston to San Francisco, 22 days out.

Feb. 21, 1853. Lat. 19° 17′ N.; long. 30° 40′ W. Barometer, 30.00; temperature of air, 75°; of water, 74°. Winds: W., W. N. W., N. W. Light airs, and hazy.

Feb. 22. Lat. 18° 20′ N.; long. 30° 11′ W. Barometer, 30.00; temperature of air, 73°; of water, 73°. Winds: variable and calm; S. E. to S. W., W., S. W. First, light and variable; middle, heavy thunder, lightning, and rain. Ends light airs, and fine weather.

Feb. 23. Lat. 17° 27′ N.; long. 30° 17′ W. Barometer, 30.10; temperature of air, 76°; of water, 74. Wind: W. S. W., calm, S. E. First and latter parts, light airs; middle, calm.

Feb. 24. Lat. 15° 15′ N.; long. 30° 45′ W. Barometer, 30.10; temperature of air, 80°; of water, 74°. Winds: S. E., S. E., S. S. E. Light breezes, and pleasant weather.

Feb. 25. Lat. 13° 25′ N.; long. 31° 11′ W. Barometer, 30.10; temperature of air, 81°; of water, 75°. Winds: S. E., S. E. by S., N. E. First and middle, light airs. Ends with moderate breezes.

Feb. 26. Lat. 11° 29′ N.; long. 31° 03′ W. Barometer, 30.10; temperature of air, 80°; of water, 75°. Winds: N. E. to E., S. E., S. E. by E.; E. S. E. Light breezes, with calms.

Feb. 27. Lat 9° 13′ N.; long 30° 28′ W. Barometer, 30.10; temperature of air, 83°; of water, 78°; Winds: E. S. E., E. by S., E. by S. Light breezes, and pleasant weather.

Feb. 28. Lat. 6° 41′ N.; long. 29° 21′ W. Barometer, 30.10; temperature of air, 84°: of water, 78°; Winds: E. by S., E., E. Moderate breezes, and pleasant.

March 1. Lat. 4° 57′ N.; long. 28° 59′ W. Barometer, 30.00; temperature of air, 76°; of water, 77°. Winds: E., E. to S. W., S. W. to N. First, moderate breezes; middle, heavy rain squalls. Ends variable.

March 2. Lat. 3° 35′ N.; long. 29° 14′ W. Barometer, 30.00; temperature of air, 82°; of water, 81°. Winds: N. to S. E.; calm, W. Commences with fresh variable breezes; middle calm. Ends with light airs.

March 3. Lat. 2° 19′ N.; long. 29° 15′ W. Barometer, 30.10; temperature of air, 88°; of water, 82°. Winds: variable; light variable airs, with rain squalls.

March 4. Lat. 0° 01′ N.; long. 29° 55′ W. Barometer, 30.10; temperature of air, 77°; of water, 81°. Winds: E. S. E., S. E. by S., S. E. by S. Moderate breezes, with rain squalls.

March 5. Lat. 2° 37′ S.; long. 31° 15′ W. Barometer, 30.10; temperature of air, 63°; of water, 81°. Winds: S. E. by S., S. E. by S., S. E. by S. Moderate breezes, with light rain showers.

March 6. Lat. 5° 17′ S.; long. 32° 45′ W. Barometer, 30.20; temperature of air, 84°; of water, 81°. Winds: S. E. by S., S. S. E., S. E. by S. First and middle parts fresh breezes; latter moderate. Passed 8 miles west of Fernando de Noronha.

Ship Sea Serpent (Howland), New York for San Francisco, eleven days out.

Feb. 23, 1853. Lat 22° 44′ N.; long. 41° 24′ W. Barometer, 29.70; temperature of air, 72°; of water, 72°. Winds: S. W., S. W. by S., S. W. by S. Moderate and pleasant; brisk and squally; latter, steady breezes, with fine weather.

Feb. 24. Lat. 19° 25′ N.; long. 39° 26′ W. Barometer, 29.70; temperature of air, 72°; of water, 72°. Winds: S. W., N. W., N. N. W. Brisk and fine weather; middle, some rain; latter, moderate and fine weather.

Feb. 25. Lat. 18° 7′ N.; long. 38° 57′ W. Barometer, 29.80; temperature of air, 75°; of water, 76°. Winds: N. N. W., W. N. W., N. W. Light breezes, and fine weather.

Feb. 26. Lat. 16° 56′ N.; long. 37° 49′ W. Barometer, 29.80; temperature of air, 72°; of water, 74°. Winds: N. N. W., north, and N. N. E. Light breezes and fine weather.

Feb. 27. Lat. 14° 29′ N.; long. 36° 30′ W. Barometer, 29.90; temperature of air, 73°; of water, 74°. Winds: north, N. E., E. N. E. Light breezes and fine weather. At 6 P. M. took the N. E. trades. Lat. 15°. N.; long. 36° 13′ W.

Feb. 28. Lat. 11° 33′ N.; long, 34° 45′ W. Barometer, 29.80; temperature of air, 75°; of water, 75°. Wind: E. N. E. Moderate, unsteady breezes, with fine weather.

March 1. Lat. 8° 15′ N.; long. 32° 30′ W. Barometer, 29.80; temperature of air, 77°; of water, 80°. Winds: E. N. E., E. N. E., N. E. by E. Moderate, unsteady breezes, and squally; ends pleasant.

March 2. Lat. 5° 19′ N.; long. 30° 57′ W. Barometer, 29.75; temperature of air, 79°; of water, 80°. Winds: E. N. E., E. N. E., E. by N. Moderate, unsteady breezes, and fine weather.

March 3. Lat. 2° 52′ N.; long. 30° 04′ W. Barometer, 29.75; temperature of air, 82°; of water, 82°. Winds: E. by N., east, E. by N. Commences moderate and pleasant; middle, light and squally; latter, pleasant.

March 4. Lat. 0° 05′ S.; long. 30° 23′ W. Barometer, 29.75; temperature of air, 82°; of water, 82°. Winds: east, E. S. E., S. S. E. to E. by S. Moderate and unsteady; some rain; middle, variable and unsteady; ends pleasant. At 11 A. M. crossed the equator, in 19 days 16 hours.

March 5. Lat. 2° 57′ S.; long. 31° 21′ W. Barometer, 29.80; temperature of air, 83°; of water, 81°. Winds: S. E., S. E. by S., S. E. First, heavy clouds from S. E.; moderate breeze; middle, squally, with rain; ends pleasant, with a moderate breeze.

March 6. Lat. 6° 14′ S.; long. 33° 12′ W. Barometer, 29.80; temperature of air, 82°; of water, 82°; water (18 feet below surface), 81°. Winds: S. E. by S., S. E. by S., S. E. Moderate trade and fine weather. At 7 P. M., Fernando de Noronha bore west eight miles. Ends moderate, fine weather.

New York to Rio.—MARCH.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From 40° 27′ N.	74° 00′ to										
39 11	70 00	E. S. E.	199	9.6	218	2.2	*w* 10.7	7.5	79.7	2.0	448
37 43	65 00	E. S. E.	256	7.0	274	1.4	7.8	7.0	83.9	2.0	353
36 03	60 00	E. S. E.	261	6.7	278	2.4	6.6	3.0	88.0	6.7	181
36 03	55 00 *d*	E.	243	6.5	259	2.1	6.3	4.9	86.7	4.7	142
35 00	53 43	S. E.	89	6.1	94	0.9	1.8	*w* 14.4	82.9	4.2	113
31 53	50 00	S. E.	265	12.6	298	6.0	4.5	3.0	86.5	0.0	65
30 05	45 00 *d*	E. S. E.	284	12.2	318	5.1	6.8	6.8	81.3	0.0	60
25 00	45 00	S.	305	8.8	331	0.0	*w* 15.5	12.4	72.1	8.6	32
20 23	40 00	S. E.	399	10.5	441	0.0	*w* 22.5	15.0	62.5	0.0	40
20 00	39 35	S. E.	33	4.5	34	0.0	6.0	*w* 12.0	82.0	2.0	45
15 36	35 00	S. E.	370	3.7	484	0.0	*w* 14.8	0.0	85.2	0.0	27
15 00	34 23 *d*	S. E.	51	10.1	56	3.6	7.2	7.2	82.0	0.0	56
10 00	32 16	S. S. E.	324	1.0	327	0.0	*w* 5.1	0.0	94.9	0.0	60
5 00	30 10 *d*	S. S. E.	324	9.8	355	3.9	*w* 11.7	1.3	83.1	3.7	78
Equator	30 10 *d*	S.	300	3.0	309	1.4	*w* 2.8	0.0	95.8	2.0	143
1 00 S.	30 35	S. S. W.	65	2.1	66	0.0	*w* 7.4	0.0	92.6	4.8	299
1 25	31 00	S. W.	35	4.0	37	0.0	*w* 13.4	0.0	86.6	0.0	15
3 00	31 40	S. S. W.	103	0.0	103	0.0	0.0	0.0	100.0	0.0	6
3 48	32 00	S. S. W.	52	8.8	56	0.0	*w* 22.2	0.0	77.8	0.0	9
5 00	32 30	S. S. W.	78	0.0	78	0.0	0.0	0.0	100.0	0.0	10
6 12	33 00	S. S. W.	78	0.0	78	0.0	0.0	0.0	100.0	0.0	15
7 00	33 20	S. S. W.	52	0.0	52	0.0	0.0	0.0	100.0	40.0	25
8 36	34 00	S. S. W.	104	4.5	109	0.0	*w* 14.0	0.0	86.0	0.0	49
9 00	34 10	S. S. W.	26	3.2	27	0.0	*w* 9.8	0.0	90.2	0.0	82

Shortest distance to the equator by this route, 3,703 miles. Average distance to be sailed on account of adverse winds, 3,976 miles.

This and the February route are the most favorable. After crossing 5° N. if you can lay up S. S. E. to the line, do so.

Ship Golden State (L. F. Doty), New York to San Francisco, nineteen days out.

Feb. 27, 1853. Lat. 18° 1′ N.; long. 30° 54′ W. Temperature of air, 71°; of water, 71°. Winds: S. by W., north, N. E. Small breezes, and smooth sea; passing clouds.

Feb. 28. Lat. 15° 25′ N.; long. 29° 52′ W. Temperature of air, 71°; of water, 70°. Winds: N. E., N. N. E., N. E. Light breezes.

March 1. Lat. 12° 9′ N.; long. 29° 32′ W. Winds: N. E., E. N. E., E. N. E. Moderate trades, and hazy; all sail.

March 2. Lat. 9° 00′ N.; long. 28° 50′ W. Temperature of air, 71°; water, 70°. Winds: N. E., N. E. by E., N. E. by E. Fine trades, and hazy.

March 3. Lat. 5° 6′ N.; long. 27° 52′ W. Temperature of air, 71°; of water, 70°. Winds: N. E. Brisk trades, and fine weather.

March 4. Lat. 2° 56′ N.; long. 27° 3′ W. Temperature of air, 74°; of water, —. Winds: east, east, E. S. E. Moderate and hazy.

March 5. Lat. 1° 43′ N.; long. 28° 1′ W. Temperature of air, 76°; of water, 70°. Winds: S. E. by S. Light breezes and clear.

March 6. Lat. 0° 46′ S.; long. 28° 50′ W. Winds: S. E. by S., S. E., S. E. Light airs, and pleasant.

March 7. Lat. 2° 28′ S.; long. 29° 51′ W. Temperature of air, 77°; of water, 70°. Wind: S. E. Moderate breezes, and clear.

March 8. Lat. 3° 36′ S.; long. 30° 15′ W. Temperature of air, 79°; of water, 70°. Wind: S. E. Small breezes and clear.

March 9. Lat. 5° 35′ S.; long. 31° 20′ W. Temperature of air, 79°; of water, 70°. Wind: S. E. Light trades, and clear weather.

Ship Paragon (Samuel Duncan), New York to San Francisco, twenty days out.

Feb. 28, 1853. Lat. 18° 20′ N.; long. 30° 18′ W. Barometer, 30; temperature of air, 72°; of water, 74°. Winds: N. N. E., N. E., N. E. Fresh breezes; trades, beyond a doubt.

March 1. Lat. 14° 54′ N.; long. 29° 13′ W. Barometer, 30; temperature of air, 73°; of water, 75°; Winds: N. E., E. N. E., N. E. by E. Fresh breezes; passed through strong tide rips, but experienced no currents.

March 2. Lat. 12° 11′ N.; long. 28° 27′ W. Temperature of air, 75°; of water, 77°. Winds: N. E. by E., E. N. E., E. N. E. Comes in fresh; ends good breeze, light showers.

March 3. Lat. 8° 30′ N.; long. 27° 33′ W. Barometer, 29.90; temperature of air, 78°; of water, 80°. Winds: N. E., E., E. N. E. Commences with good breezes and light showers of rain; ends fresh, with heavy appearances in the S. E.

March 4. Lat. 5° 7′ N.; long. 26° 49′ W. Var. obs. 12°. Barometer, 29.9; temperature of air, 80°; of water, 81°. Winds: E. N. E., E. N. E., E. N. E. Comes in fresh, thick and hazy weather; ends moderate and fine.

March 5. Lat. 3° N.; long. (D. R.) 26° 59′ W. Barometer, 29.90; temperature of air, 80°; water, 83°. Winds: E. N. E., S. E., E. S. E. Commences moderate; black and heavy in the S. E.; middle and latter, light and unsteady, with rain.

March 6. Lat. 1° 38′ N.; long. 27° 16′ W. Barometer, 29.9; temperature of air 82°; of water, 84°. Winds: N. E., N. E., S. E. First and middle parts light and baffling, with rain.

March 7. Lat. 34′ N.; long. 27° 31′ W. Barometer, 29.90; temperature of air, 84°; of water, 85°. Winds: S. E., E., N. E. Light and baffling, and occasionally calm.

March 8. Long. 27° 50′ W. Current, ¾ of a mile per hour, S. W. Barometer, 29.60; temperature of air, 85°; of water, 85°. Winds: E. N. E., calm, E. Commences light; middle part calm; latter, very light. At noon on the equator, in long. 27° 50′ W.

March 9. Lat. 1° 10′ S.; long. 27° 50′ W. Var. obs. 10°. Barometer, 29.90; temperature of air, 86°; of water, 85°. Winds: E. N. E., E., E. A light breeze; clouds have very little motion.

March 10. Lat. 2° 52′ S.; long. 29° 28′ W. Var. obs. 7°. Barometer, 29.80; temperature of air, 82°; of water, 84°. Winds: S. by E., S. by E., S. by E. Brisk breezes and fine weather.

March 11. Lat. 4° 55′ S.; long. 30° 26′ W. Barometer, 29.80; temperature of air, 83°; of water, 83°. Winds: S. by E., S. S. E., S. E. Brisk breezes; passed under the sun.

Ship Sword-Fish (C. Collins), New York for San Francisco, fifteen days out.

Feb. 27, 1853. Lat. 22° 54′ N.; long. 36° 30′ W. Barometer, 30.00; temperature of air, 72°; of water,* 71½°; of water, 70°. Winds: N., N. N. E., N. E.; light winds and clear weather. I think we now have what are called trade-winds.

Feb. 28. Lat. 19° 32′ N.; long. 35° 40′ W. Current, ¼ mile per hour, to the westward. Barometer, 30.00; temperature of air, 75°; of water, 74°; of water, 69°. Winds: E. N. E., E., E. to E. S. E.; light airs; middle part, good breeze; latter part, calm, with light puffs. Aneroid barometer, 29.56.

March 1. Lat. 16° 03′ N.; long. 34° 28′ W. Barometer, 29.80; temperature of air, 75°; of water, 73°; of water, 70½°. Winds: E. N. E., E. by S., E. by S.; good breezes throughout; latter part, wind comes in puffs; the barometer has been, during these 24 hours, as low as 29.62; wind inclined southerly; Aneroid barometer, 29.78.

March 2. Lat. 12° 21′ N.; long. 33° 12′ W. Current, 29 miles, W. by S. during the last two days.

* Surface.

Barometer, 29.76; temperature of air, 74°; of water, 74°; of water, 71°. Winds: E. S. E., E. S. E., S. E. by E. ½ E.; fine, clear weather; the ship has been close-hauled—log distance run 240 miles.

March 3. Lat. 8° 25′ N.; long. 31° 35′ W. Current, ⅛ mile per hour, to S. and W. Barometer, 29.75; temperature of air, 74°; of water, 78°; of water, 74°. Wind: E. S. E. throughout; throughout fine breezes—cannot say trades—I have been too often humbugged; ship by the wind; log dist. run 260 miles.

March 4. Lat. 4° 37′ N.; long. 29° 50′ W. Current, 1 mile per hour, W. by N. Barometer, 29.66; temperature of air, 80°; of water, 80°; of water, 77°. Winds: E. S. E., E. by S., E. by S.; good wind; clear weather.

March 5. Lat. 2° 55′ N.; long. 29° 23′ W. Current, 1½ miles per hour, W. Barometer, 29.70; temperature of air, 78°; of water, 80°; of water, 76°. Winds: calm, calm, E. to S. W.; calms, and light airs throughout; very heavy looking squalls, all on the horizon; very little wind in them, but a great quantity of water.

March 6. Lat. 1° 48′ N.; long. 29° 06′ W. Current, 2 miles per hour, W. by N. Barometer, 29.80; temperature of air, 80°; of water, 80°; of water, 80°. Winds: calm, E. S. E., calm, and E. S. E.; light airs and calms; very heavy showers of rain; weather, during the last four days, very warm and close; passed through a tide rip setting W. by N.

March 7. Lat. 0° 18′ N.; long. 29° 8′ W. Current, 1 mile per hour, W. S. W. Barometer, 29.76; temperature of air, 79°; of water, 79°; of water, 79°. Winds: calm, baffling, calm, and east. Throughout, calms and light airs; very warm and sultry; several vessels in sight. At 10 P. M. passed Island St. Paul's, distant 4 miles.

March 8. Lat. 1° 06′ S.; long. 29° 6′ W. No current. Barometer, 29.75; temperature of air, 80°; of water, 80°; of water, 79°. Winds: calm, calm, S. E. by E. Another day of light airs and calms. At 1 P. M., on the equator, log distance run to the line 4,135 miles in 22 *days.* You will see by this abstract that your route was followed to the letter, and has proved satisfactory after so many hard pulls and drawbacks as I have had while running to Rio Janeiro. I should evidently have been on the line Sunday last, had the breezes held good, but my luck "calms," which, I am sorry to say, you will often see in this book.

A model track. Compare it with the tracks of the Golden State and the Paragon (p. 377). They crossed the parallel of 18° W. in about 31°, the one 29, the other 27 days out. The Sword-Fish crossed this parallel near the meridian of 35° W., 16 days out, and was south of the equator 6 days afterwards, beating the former several days again.

I would recommend vessels in coming out of New York and Boston, to stand off well to the eastward when the winds are fair, before attempting to make any southing. The degrees there are short, and by standing as far as 60° or 50° before crossing the parallel of 40°, you have a better chance for running south across the Horn latitudes.

This recommendation applies to all months, but only when the winds are fair for easting.

March 9. Lat. 2° 57′ S.; long. 29° 23′ W. Current, three-fourths of a mile per hour, W. by S. Barometer, 29.70; temperature of air, 81°; of water, 81°; of water, 79°. Winds: calm and east, calm, S. E. by S.; fine clear weather, light airs and calm.

March 10. Lat. 5° 39′ S.; long. 30° 13′ W. Current, half mile per hour, W. Barometer, 29.72; temperature of air, 82°; of water, 82°; of water, 82°. Winds: calm and S. E., S. E. and E., S. E. by S. Very light trades; fine weather; had main-topsail in three hours to fix the masthead.

Ship Sirocco (J. L. Sanford), New York to San Francisco, seventeen days out.

March 5, 1853. Lat. 22° 09′ N.; long. 34° 00′ W. Barometer, 30.60. Winds: E., E., and E. N. E. Fresh breezes and squally weather.

March 6. Lat. 18° 26′ N.; long. 32° 33′ W. Barometer, 30.40. Winds: E. by S., E. by N., and E. Commence with fresh breezes and pleasant weather. Latter, squally and hazy.

March 7. Lat. 14° 40′ N.; long. 31° 00′ W. Barometer, 30.20. Winds: E. N. E., E. by N., and E. N. E. Strong breezes and squally, with rain. Ends clear, with fine breezes.

March 8. Lat. 11° 03′ N.; long. 30° 00′ W. Barometer, 30.20. Winds: E. N. E., E. N. E., and N. E. Pleasant breezes, with clear pleasant weather.

March 9. Lat. 7° 49′ N.; long. 28° 54′ W. Barometer, 30.10. Winds: E. N. E., E. N. E., and N. E. Light breezes, with hazy weather and light rain.

March 10. Lat. 4° 26′ N.; long. 28° 00′ W. Barometer, 30.20. Winds: E. N. E., E., and N. E. Pleasant breezes and hazy weather.

March 11. Lat. 2° 00′ N.; long. 28° 00′ W. Barometer, 30.30. Winds: E. N. E., S. W., and N. W. Fine breezes and clear. At dark, much lightning. Middle part, squally with rain; latter part, light airs and calms.

March 12. Lat. 0° 10′ N.; long. 28° 05′ W. Barometer, 30.30. Winds: E. N. E., variable, and N. Light breezes and occasionally calm. Twenty-five days from New York to the line.

March 13. Lat. 0° 32′ S.; long. 28° 10′ W. Barometer, 30.30. Winds: north, calm, and squally. Light airs and fine weather. Ends calm and squally.

March 14. Lat. 0° 56′ S.; long. 28° 20′ W. Barometer, 30.20; temperature of air, 80°; of water, 81°. Winds: calm, S. W., and calm. Light variable airs and calm. I find very little change in the barometer; weather clear and squally.

March 15. Lat. 0° 54′ S.; long. 28° 10′ W. Barometer, 30.20. Current, west, 12 miles. Temperature of air, 79°; of water, 80°. Light airs, and calm from the S. W.

March 16. Lat. 1° 10′ S.; long. 28° 20′ W. Barometer, 30.10. Current, W. S. W., 12 miles. Temperature of air, 79°; of water, 81°. Calm and squally; rain all around the compass.

March 17. Lat. 2° 20′ S.; long. 28° 45′ W. Barometer, 30.10; temperature of air, 80°; of water, 81°. Very light airs from the N. E. and N. W.

March 18. Lat. 3° 44′ S.; long. 29° 15′ W. Barometer, 30.00; temperature of air, 79°; of water, 81°. Winds: calm, E. S. E., and S. E. First part, calm; middle and latter parts, squally.

March 19. Lat. 5° 59′ S.; long. 30° 30′ W. Barometer, 30.10; temperature of air, 79°; of water, 81°. Winds: S. E., S. E., and S. S. E. Light breezes and clear weather; middle part, squally.

Ship New York (David C. Baxter), New York to San Francisco, fifteen days out.

March 7, 1853. Lat. 20° 38′ N.; long. 40° 29′ W. Barometer, 29.09; temperature of air, 74°; of water, 73°. Winds: E. by N., E. by N., E. by N.; strong trades and squally, heading up S. E. and off S.

March 8. Lat. 18° 29′ N.; long. 39° W. Barometer, 29.07; temperature of air, 74°; of water, 74°. Winds: E. by N., E. to E. by N., E. by N. ½ N.; strong trades, squally.

March 9. Lat. 16° 44′ N.; long. 37° W. Barometer, 29.07; temperature of air, 74°; of water, 74°. Winds: E. N. E., E. N. E., E. N. E.; strong trades, with some hard squalls.

March 10. Lat. 14° 19′ N.; long. 34° 56′ W. Barometer, 29.07; temperature of air, 76°; of water, 76°. Winds: E. N. E., E. N. E., E.; fine breezes without squalls; smooth sea.

March 11. Lat. 11° 36′ N.; long. 33° 25′ W. Barometer, 29.07; temperature of air, 78°; of water, 78°. Winds: E., E. by N., E. ½ N.; first part, moderate; middle, squally; latter, brisk.

March 12. Lat 9° 41′ N.; long. 31° 30′ W. Barometer, 29.07; temperature of air, 80°; of water, 78°. Winds: E. by N., E. by N., E. by N. ½ N.; same as yesterday.

March 13. Lat. 7° 17′ N.; long. 29° 12′ W. Barometer, 29.06; temperature of air, 82°; of water, 80°. Winds: E. N. E., E. N. E., E. N. E.; moderate trades.

March 14. Lat. 4° 50′ N.; long. 28° 30′ W. Barometer, 29.06; temperature of air, 82°; of water, 81°. Winds: E. N E., E., N. by E.; commences moderate; middle part, light; ends nearly calm.

March 15. Lat. 2° 30′ N.; long. 28° 30′ W. Barometer, 29.06; temperature of air, 82°; of water, 82°. Winds: N. by E., N. by E., N. E.; first part, very light airs; middle, increasing; ends with a good breeze.

March 16. Lat. 0° 58′ N.; long. 28° 25′ W. Barometer, 29.06; temperature of air, 82°; of water, 82°. Winds: N. N. E., N. E., N. N. E.; commences a moderate N. E. wind; from 6 to 10 P. M., baffling from E. to W., and raining in torrents; middle part, light air from E. N. E.; ends with light breeze.

March 17. Lat. 0° 22′ S.; long. 28° 35′ W. Barometer, 29.06; temperature of air, 84°; of water, 83°. Winds: N. N. E., N. N. E., N.; first and middle parts, a light air; ends with gentle breezes; no rain.

March 18. Lat. 1° 48′ S.; long. 28° 45′ W. Barometer, 29.05; temperature of air, 84°; of water, 82°. Winds: N., E. N. E., S. E. by S.; light breezes, at times nearly calm; some rain.

March 19. Lat. 3° 57′ S.; long. 29° 45′ W. Barometer, 29.05; temperature of air, 82°; of water, 82°. Winds: S. E. by S., S. E. by S., S. E. by S.; commences a light breeze; latter part, squalls of wind and rain.

March 20. Lat. 5° 37′ S.; long. 30° 40′ W. Barometer, 29.06; temperature of air, 83°; of water,

82°. Winds: S. E. by S., S. E. by S., S. E. by S.; squally; wind veering from S. S. E. and S., to S. E. by E.

Ship St. Lawrence (Robertson), New York to San Francisco, twenty-eight days out.

March 8, 1853. Lat. 19° 04′ N.; long. 27° 50′ W. Winds: N. E., N. E., E. N. E.; first part, fresh trades; middle, squally; latter, more steady.

She goes the old route. The New York (p. 381), is going along the new route at the same time; the former crossing the parallel of 19° N. the sixteenth day; the latter, the twenty-eighth; and thence to the line, the passage is the same.

March 9. Lat. 16° 00′ N.; long. 28° 15′ W. Winds: E. N. E., E. N. E., N. E.; fresh trades throughout.

March 10. Lat. 13° 21′ N.; long. 28° 35′ W. Wind: N. E.; fresh trades, with passing squalls.

March 11. Lat. 10° 40′ N.; long. 28° 15′ W. Wind: N. E.; passing squalls.

March 12. Lat. 7° 28′ N.; long. 28° 18′ W. Wind: E. N. E., and fine.

March 13. Lat. 4° 35′ N.; long. 28° 00′ W. Winds: N. E., N. E., E. N. E.; fine breezes.

March 14. Lat. 2° 35′ N.; long. 27° 52′ W. Wind: N. N. E. throughout, and fine.

March 15. Lat. 1° 20′ N.; long. 27° 55′ W. Winds: N. N. E., north, N. W. to S. W.; light winds, with squalls; baffling.

March 16. Lat. 00° 03′ N.; long. 28° 00′ W. Winds: N. N. E., N. N. E., north; squally, baffling, and rainy.

March 17. Lat. 00° 42′ S.; long. 28° 05′ W. Winds: N. E., N. E., E. N. E.; light and pleasant.

March 18. Lat. 1° 49′ S.; long. 28° 12′ W. Winds: east, E. S. E., S. E.; light winds, have the S. E. trades.

March 19. Lat. 3° 10′ S.; long. 29° 00′ W. Winds: S. E., S. S. E., S. S. E.; light winds and pleasant.

March 20. Lat. 5° 20′ S.; long. 29° 00′ W. Wind: S. S. E.; light winds, with rain squalls.

March 21. Lat. 7° 47′ S.; long. 29° 40′ W. Wind: S. E.; throughout with squalls of rain.

Ship Stag-Hound (C. F. W. Behm), New York to San Francisco, sixteen days out.

March 13, 1853. Lat. 17° 15′ N.; long. 34° 2′ W. Barometer, 30.05; temperature of air, 72°; of water, 72°. Winds: E. S. E., S. E. by E., E. S. E. Light trades and fine weather.

March 14. Lat. 14° 30′ N.; long. 33° 23′ W. Barometer, 30.00; temperature of air, 72°; of water, 73°. Wind: E. S. E. Light trades, and fine.

March 15. Lat. 10° 48′ N.; long. 31° 58′ W. Barometer, 30.00; temperature of air, 77°; of water, 76° Winds: E. S. E., E. by S., E. by S. Light trades and fine weather.

March 16. Lat. 7° 10′ N.; long. 30° 47′ W. Barometer, 29.26; temperature of air, 77°; of water, 78°. Winds: E. by S., E. S. E., east. Light trades. Ends with squally appearances in N. E.

March 17. Lat. 3° 41′ N.; long. 29° 45′ W. Barometer, 29.95; temperature of air, 79°; of water, 80°. Winds: N. E., E. N. E., E. N. E. Light trades and cloudy, with light showers during the night.

March 18. Lat. 0° 10′ N.; long. 29° 27′ W. Barometer, 29.90; temperature of air, 79°; of water, 80°. Winds: E. N. E., E. N. E., E. S. E. Ends with fine breeze from southward and eastward, and clearing up. Perhaps we shall have no doldrums.

March 19. Lat. 2° 24′ S.; long. 30° 41′ W. Current, west, 1¼ knots per hour. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: east, variable, S. E. Light airs, with occasional showers.

March 20. Lat. 4° 59′ S.; long. 32° 08′ W. Current, S. 80 W., 1 knot. Barometer, 29.95; temperature of air, 78°; of water, 82°. Winds: S. E. Thunder squalls.

March 21. Lat. 7° 17′ S.; long. 33° 15′ W. Current, N. by W., ½ knot. Barometer, 29.95; temperature of air, 78°; of water, 82°. Winds: S. E., S. E. by S., S. E. by S. Light breeze and squally, at times almost calm, but little rain.

Ship Hampton, New York to San Francisco, twenty-three days out.

March 14. Lat. 19° 46′ N.; long. 33° 47′ W. Barometer, 30.05; temperature of air, 74°; of water, 76°. Winds: E., E., E. Steady breezes and fine weather.

March 15. Lat. 17° 37′ N.; long. 32° 12′ W. Barometer, 30.05; temperature of air, 75°; of water, 76°. Winds: E., E., and E. by N. Steady breezes and fine weather.

March 16. Lat. 15° 25′ N.; long. 31° 06′ W. Barometer, 30.05; temperature of air, 75°; of water, 76°. Winds: E. by N., E., and E. by N. Steady breezes and fine weather.

March 17. Lat. 12° 44′ N.; long. 29° 56′ W. Barometer, 30.05; temperature of air, 74°; of water, 76°. Wind: E. by N. throughout. Steady breezes and fine weather.

March 18. Lat. 10° 09′ N.; long. 29° 20′ W. Barometer, 30.00; temperature of air, 75°; of water, 77°. Winds: E. N. E., E. by N., E. N. E. Pleasant weather; strong upper current from S. E.

March 19. Lat. 7° 36′ N.; long. 29° 05′ W. Barometer, 30.00; temperature of air, 76°; of water, 78°. Winds: E. N. E., E. by N., and N. E. Steady trades.

March 20. Lat. 4° 36′ N.; long. 29° 00′ W. Barometer, 30.00; temperature of air, 76°; of water, 78°. Wind: N. E. throughout; fine steady breezes from the N. E.

March. 21. Lat. 1° 39′ N.; long. 29° 15′ W. Barometer, 30.00; temperature of air, 80°; of water, 83°. Wind: N. E. throughout. Steady winds.

March 22. Lat. 0° 09′ S.; long. 29° 20′ W. Barometer, 30.00; temperature of air, 82°; of water, 82°. Winds: E., S. E., S. E. Light breezes and pleasant.

Here, again, is an illustration of going farther east than is necessary. Compare the Hampton's track with that of the Stag-Hound (p. 382), about 2° to the west of her, upon the parallel of 20° N. No comment is required.

☞ Never, from the United States, care to cross the parallel of 20° N., east of 35°. If you are

forced there by adverse winds, it is another thing. But attention to these tracks—and they are taken at random—will show that, in the winter and spring especially, vessels not only have quite as quick a run, 20° to the line, when they cross that parallel west of 35°, as they do when they cross it to the east of that meridian; but what is more, they have often a week or ten days less to that crossing from the United States. As an example, see Roscoe's track (p. 385; she had 27 days from New York to the parallel of 20° east of 35°.

March. 23. Lat. 00° 23′ S.; long. 29° 43′ W. Barometer, 30.00; temperature of air, 84°; of water, 83°. Winds: N. E., E. S. E., and E.; moderate breezes, inclining to the south.

March 24. Lat. 1° 12′ S.; long. 29° 46′ W. Barometer, 30.00; temperature of air, 85°; of water, 83°. Winds: S. S. E., S. S. E., and N. E.; light and fine weather.

March 25. Lat. 2° 34′ S.; long. 29° 53′ W. Barometer, 30.20; temperature of air, 85°; of water, 83°. Winds: S. E. by S., S. S. E., and S. S. E.; light baffling winds, and hazy swell from the southward.

March 26. Lat. 4° 39′ S.; long. 30° 30′ W. Barometer, 30.02; temperature of air, 85°; of water, 83°. Wind: S. S. E. throughout; light breezes and clear weather.

March 27. Lat. 6° 25′ S.; long. 31° 37′ W. Barometer, 30.05; temperature of air, 87°; of water, 83°. Wind: S. S. E., S. E. by S., S. E. by S.; light steady breezes and cloudy.

March 28. Lat. 8° 14′ S.; long. 32° 15′ W. Barometer, 30.15; temperature of air, 88°; of water, 83°. Winds: S. E. by S., S. E., S. E.; cloudy with light showers.

English barque Emir, Gloucester (Eng.) to Calcutta, sailed February 26, 1849.

March 21, 1849. Lat. 6° 4′ N.; long. 22° 1′ W. Winds: E., E. S. E., E. Moderate winds and fine weather. All possible sail set.

March 22. Lat. 4° 29′ N.; long. 22° 1′ W. Wind: E. Steady winds and fine weather.

March 23. Lat. 3° 17′ N.; long. 20° 54′ W. Winds: E., E. N. E., E. Light winds and cloudy.

March 24. Lat. 2° 9′ N.; long. 20° 12′ W. Variable winds; light airs, and at times calm.

March 25. Lat. 1° 58′ N.; long. 20° 39. W. Variable winds; first part, light airs; latter part, squally, with heavy rain.

March 26. Lat. 1° 21′ N.; long. 20° 34′ W. Winds: S. to S. E., and S. W.; light, foul airs, and calm at times.

March 27. Lat. 1° 33′ N.; long. 20° 10′ W. Variable winds. Calms and light variable airs.

March 28. Lat. 1° 11′ N.; long. 20° 38′ W. Wind: variable, and S. E.; first part, light; latter, moderate breeze.

March 29. Lat. 1° 34′ N.; long. 20° 51′ W. Winds: calm, calm, S. E.

March 30. Lat. 38′ S.; long. 21° 11′ W. Wind: S. E. Got the S. E. trades moderate and fine.

March 31. Lat. 1° 47′ S.; long. 21° 11′ W. Wind: S. E.; light trade-wind and fine weather.

I have quoted this very well kept English log, to illustrate the difficulties of crossing the doldrums far to the eastward.

When vessels do fall to leeward of St. Roque, as, by attempting to shave the new route too close, they now and then do, it is very seldom that they are a week in making $3\frac{1}{2}°$ of latitude, as the Emir was, in getting through these doldrums from 2° N. to 1° 47′ S.

Ship Roscoe (Thomas Smith), New York to San Francisco, twenty-seven days out.

March 24, 1853. Lat. 21° 31′ N.; long. 32° 08′ W. Current E. by S., one knot per hour. Variable, 16° W. Barometer, 30.11; temperature of air, 74°; of water, 73°. Winds: W. S. W., N. W., N.; first part, light airs; middle and latter parts, good breezes.

March 25. Lat. 19° 17′ N.; long. 32° W. Barometer, 30.05; temperature of air, 75°; of water, 73°. Winds: N., N., N. N. E.; pleasant breezes throughout.

March 26. Lat. 16° 27′ N.; long. 31° 24′ W. Barometer, 30.06; temperature of air, 75°; of water, 74°. Winds: N. N. E., E. by N., E. by N.; fresh breezes throughout; squally during the middle part.

March 27. Lat. 13° 10′ N.; long. 30° 41′ W. Barometer, 30.5; temperature of air, 75°; of water, 74°. Winds: E. by N., E. by N., E. N. E.; fresh breezes; middle part, squally; latter part, blowing strong trade; saw a tide rip this day.

March 28. Lat. 9° 54′ N.; long. 30° 00′ W. Barometer, 30.5; temperature of air, 78°; of water, 77°. Winds: E. N. E., E. N. E., northward; first part, fresh breezes; middle, same; latter part, pleasant.

March 29. Lat. 6° 46′ N.; long. 29° 00′ W. Barometer, 29.98; temperature of air, 79°; of water, 79°. Winds: northward, E. N. E., E. N. E.; throughout the day, fresh breezes and pleasant.

March 30. Lat. 3° 40′ N.; long. 28° 20′ W. Barometer, 29.94; temperature of air, 83°; of water, 80°. Winds: E. N. E., E. N. E., E. N. E.; fresh breezes and squally; looks very much like rain, we have had none as yet; air very close.

March 31. Lat. 1° 00′ N.; long. 28° 00′ W. Barometer, 29.90; temperature of air, 85°; of water, 82°. Winds: E. N. E., E. N. E., baffling, east; first part, fresh breezes; middle, squally; at 8 h. 30 m. A. M., had a heavy squall of wind and rain from the S. S. E.; latter part, light baffling airs from E. to N. E.; saw a great many porpoises this day.

April 1. Lat. 0° 44′ S.; long. 28° 00′ W. Current, half knot per hour, westerly. Barometer, 30.00; temperature of air, 85°; of water, 80°. Winds: E. to E. S. E., E., E. S. E.; first part, light breezes. At 10 A. M. a heavy squall, accompanied with rain from the south; latter part, light airs. We crossed the equator about midnight, in about 27° 38′ W. My intention was to have crossed it in 30° 00′ W., in the fore part of my voyage, had I not had to run so far to the eastward on the 28th and 29th, on account of winds. [I do not understand why the Roscoe had to run so far to the east there. She had the wind north of west, the 28th, to make a course, good to the line, of about S. by E., not more.] When the wind let me come on the other tack, I could make little easting every day without taking off much of my latitude. We crossed the equator without any calm, and did not go less than four and a half to five miles per hour all the way through.

April 2. Lat. 3° 04′ S.; long. 29° 10′ W. Barometer, 30.00; temperature of air, 84°; of water, 80°. Winds: S. E. by S., S. E. by S., S. E. by S.; fresh breezes for the twenty-four hours.

April 3. Lat. 5° 41′ S.; long. 31° 30′ W. Seventeen miles current in twenty-four hours, setting S. W. ½ S. Barometer, 29.90; temperature of air, 83°; of water, 81°. Winds: S. E. by S., S. S. E., S. S. E.; first part, fresh breezes; middle and latter parts, baffling and fresh breezes at noon, barometer falling. I should think there was going to be a gale of wind; vessel leads off from S. S. W. to W.; almost calm, and then gusts of wind.

Ship Surprise (Charles A. Ranlett), New York to San Francisco, twelve days out.

March 25, 1853. Lat. 21° 49′ N.; long. 41° 59′ W. Barometer, 30.50; temperature of air, 76°; of water, 76°. Winds: calm, S. E., E. S. E. Middle and latter parts, light airs.

March 26. Lat. 18° 58′ N.; long. 41° 48′ W. Current, four-tenths of a knot per hour, westerly. Barometer, 30.00; temperature of air, 76°; of water, 76°. Winds: S. E., E. S. E., S. E. First part, a light breeze, some squalls; not very strong during the day.

March 27. Lat. 15° 34′ N.; long. 40° 27′ W. Westerly current, one knot per hour. Barometer, 30.00; temperature of air, 79°; of water, 77°. Winds: E. S. E., east, east. First part, good fresh breeze; stronger during the middle and latter parts; trades, I think. The barometer keeps up rather high for these latitudes.

March 28. Lat. 12° 35′ N.; long. 38° 48′ W. Current, S. W., one knot per hour. Barometer, 29.98; temperature of air, 79°; of water, 79°. Winds: east, E. by N., east. Fresh breezes and cloudy. I am afraid I shall be too far to the westward when I cross the line, but am determined to trust to Providence and Lieut. Maury's Charts.

March 29. Lat. 10° 00′ N.; long. 36° 22′ W. No current. Barometer, 29.08; temperature of air, 79°; of water, 79°. Winds: east, E. by N., east. Good fresh breezes throughout.

March 30. Lat. 7° 23′ N.; long. 33° 59′ W. Slight easterly current. Barometer, 29.90; temperature of air, 82°; of water, 80°. Winds: E. by N. throughout. Cloudy and dusky weather. The ship lags along S. E. by S., and I am obliged to take all advantages; am fearful that I shall be jammed close by, if not to leeward of Cape St. Roque. Latter part, good fresh trades E. by N.

March 31. Lat. 4° 44′ N.; long. 31° 32′ W. Barometer, 29.88; temperature of air, 82°; of water, 80°. Winds: E. N. E., E. by N., E. by N. Clear weather and fresh breezes; am getting to the eastward finely.

April 1. Lat. 1° 57′ N.; long. 29° 46′ W. Barometer, 29.80; temperature of air, 83°; of water, 81°. Winds: east, E. N. E., E. N. E. Moderate breezes and fine weather. Set larboard studding sails, having now no fear of Cape St. Roque; light squalls during the night.

April 2. Lat. 0° 39′ S.; long. 30° 32′ W. Current, one knot per hour, westerly. Barometer, 29.80; temperature of air, 84°; of water, 81°. Winds: S. E., S. S. E., S. E. Barometer, 29.80; temperature of air, 84°; of water, 81°. Winds: S. E., S. S. E., S. E. The wind changed in a squall at noon, but continu-

ing with as much force. Passage from Sandy Hook to the line, 19 days, 18 hours. The barometer rises and falls regularly as the tides.

I should be glad if all would observe the barometer as closely. This phenomenon shows the importance of accurate barometers; I mean barometers which we may make accurate by knowing their errors. This barometer has its errors—all have. What, therefore, can we learn about this highly interesting phenomenon from such an instrument, except that it occurs?

April 3. Lat. 3° 51′ S.; long. 32° 50′ W. Current, two and a half miles per hour, westward. Barometer, 29.88; temperature of air, 85°; of water, 83°. Winds: S. S. E., S. E., S. S. E. to S. E. At 9 A. M. the Island of Fernando de Noronha bore S. by E., distance 25 miles; working the ship to the eastward.

April 4. Lat. 5° 34′ S.; long. 33° 48′ W. Barometer, 29.90; temperature of air, 85°; of water, 83°. Winds: S. E. by S., S. E., S. E.; light winds and variable. Tacked several times to gain a little more easting.

April 5. Lat. 7° 43′ S.; long. 33° 54′ W. Barometer, 29.90; temperature of air, 84°; of water, 83°. Winds: S. E., E. S. E., S. E. by S.; variable winds, and squally. Tacked several times to keep to the eastward.

Barque Rosario (Caleb Sprague), New York to Valparaiso, twenty days out.

March 26, 1853. Lat. 20° 35′ N.; long. 27° 10′ W.; variation, 18° 20′ W. Barometer, 30.12; temperature of air, 73°; of water, 72°. Winds: N. N. E., N. by E., and N. E. by N.; light airs and pleasant weather; a swell from the N. W.

March 27. Lat. 17° 57′ N.; long. 27° 10′ W. Barometer, 30.14; temperature of air, 72°; of water, 72°. Winds: N. E. by N., N. E., and E. N. E.; light airs throughout.

March 28. Lat. 14° 49′ N.; long. 27° 10′ W. Barometer, 30.10; temperature of air, 71°; of water, 72°. Winds: E. N. E., N. E., and E. N. E.; first part, light airs; middle and latter part, fresh breezes, and passing rain squalls.

March 29. Lat. 11° 25′ N.; long. 26° 41′ W. Current, W., 12 miles. Barometer, 30.08; temperature of air, 74°; of water, 75°. Winds: E. N. E., N. E., and N. E.; first part, moderate breeze. At 2 P. M. passed through a strong tide rip; temperature of the air at the same time was 72°; of water, 74°; middle part, moderate; from 9 A. M. until noon, strong tide rips, but no change in the water.

March 30. Lat. 8° 23′ N.; long. 36° 14′ W. Current, N. 15° W., 18 miles; variation, 15° W. Barometer, 30.02; temperature of air, 74°; of water, 77°. Winds: N. E., E. N. E., and E. N. E.; moderate breezes; occasional tide rips.

March 31. Lat. 5° 50′ N.; long. 26° 01′ W. Current, N. 30° W., 18 miles. Barometer, 30.01; temperature of air, 78°; of water, 79°. Winds: E. N. E., and N. E.; light breezes, and strong tide rips.

April 1. Lat. 3° 22′ N.; long. 25° 49′ W. Current, W., 12 miles; variation, 13° W. Barometer, 30.01; temperature of air, 79°; of water, 80°. Winds: E. N. E., and N. E.; light airs throughout. I remark here, that it was my intention, when I sailed from New York, to have followed the track projected on Lieut. Maury's Chart, and to cross the equator further to the westward, but the winds have been mostly from the south, which has forced me to go further to the eastward than I intended. [From 27° 12′ N., this ship had N. E. winds to the equator, by her abstract.]

April 2. Lat. 2° 01′ N.; long. 26° 24′. Current, N. 51° W., 20 miles. Barometer, 29.96; temperature of air, 79°; of water, 81°. Winds: E. N. E., S. E., and S. E. by E.; first part, light air; middle part, squally, with rain, with sharp lightning; latter part, moderate. Passed through quantities of phosphoric substance; strong tide rips.

April 3. Lat. 11′ S.; long. 27° 16′ W. Current, N. 25° W., 15 miles. Variation, 10° W. Barometer, 29.95; temperature of air, 80°; of water, 81°. Winds: S. E., S. E., and S. E. by S. First part, moderate breeze and light rain squall all night; water very phosphorescent; latter part, pleasant.

April 4. Lat. 1° 32′ S.; long. 25° 31′ W. Current, W., 18 miles. Variation, 8° W. Barometer, 29.95; temperature of air, 82°; of water, 82°. Winds: S. by E., S. by E., and S. S. E. Light airs and squalls throughout. At 6 P. M., a water-spout crossed the bows a quarter of a mile distant. No change in the barometer.

April 5. Lat. 3° 30′ S.; long. 29° 53′ W. Current, W., 22 miles. Barometer, 30.01; temperature of air, 82°; of water, 82°. Winds: S. S. E., S. E., and S. E. by S. First part, light breezes and squally. At 2 P. M., showed our flag to an American sloop-of-war bound south. I find that we can sail faster than she. Latter part, fresh breeze.

April 6. Lat. 6° 23′ S.; long. 31° 7′ W. Current, S. 45° W., 14 miles. Barometer, 30; temperature of air, 81°; of water, 82°. Winds: S. E. by S., S. E., and S. E. by S. Moderate trades and fine weather.

Route to Rio, etc.—APRIL.

Latitude.	Longitude.	Course.	DISTANCES. True.	Per cent.	Average.	WINDS; PER CENT. Head.	Slants from N. & E.	S. & W.	Fair.	Calms.	Total No. observations.
From Sandy	Hook to										
39° 10′ N.	70° 00′	E. S. E.	200	10.7	221	3.6	w 11.1	5.3	80.0	4.0	523
39 10	65 00	E.	233	9.8	256	3.7	w 9.3	6.2	80.8	4.5	320
37 33	60 00	E. S. E.	254	6.2	274	2.0	w 6.6	4.0	87.4	3.2	151
35 54	55 00	E. S. E.	260	5.4	276	0.7	8.0	8.8	82.5	4.9	136
35 54	50 00	E.	243	6.1	258	0.0	w 12.2	7.2	81.6	8.1	125
35 54	45 00	E.	243	5.8	257	0.0	w 12.3	3.7	84.0	5.8	81
35 00	42 21	E. S. E.	141	7.7	152	1.5	6.2	w 10.8	81.5	0.0	65
30 00	40 00	E. S. E.	312	17.4	366	6.3	6.2	w 32.5	55.0	1.0	95
25 00	37 40	S. S. E.	325	13.8	369	3.0	17.0	w 19.0	61.0	3.0	97
20 00	35 26	S. S. E.	325	2.6	333	0.0	5.4	w 7.2	87.4	5.1	56
15 00	33 16	S. S. E.	325	2.0	331	2.0	0.0	0.0	98.0	0.0	49
10 00	31 09	S. S. E.	325	0.0	325	0.0	0.0	0.0	100.0	4.4	43
5 00	29 04	S. S. E.	325	0.6	327	0.0	1.7	0.0	98.3	0.0	59
Equator	29 04	S.	300	2.1	306	0.0	w 5.9	1.3	92.8	6.8	152
			3811		4051						
1 00 S.	29 29	S. S. W.	65	4.4	68	0.0	w 17.7	0.9	81.4	5.5	344
1 31	30 00	S. W.	44	3.3	45	0.0	w 16.7	0.0	83.3	0.0	12
2 31	31 00	S. W.	85	2.4	87	0.0	w 8.4	0.0	91.6	0.0	12
3 00	31 12	S. S. W.	31	2.4	32	0.0	w 12.0	0.0	88.0	15.0	17
5 00	32 02	S. S. W.	130	4.0	135	0.0	w 20.0	0.0	80.0	12.5	15
7 19	33 00	S. S. W.	150	2.7	154	0.0	w 13.3	0.0	86.7	0.0	15
9 00	33 42	S. S. W.	109	3.2	112	0.0	w 10.8	0.0	89.2	0.0	55

Observe that, between the meridians of 55° and 60°, the calms of the Horse Latitudes most prevail between the parallels of 21° and 27° N.; and between the parallels of 28° and 32°, between the meridians 40° and 45°.

Ship Seaman's Bride, New York to San Francisco, sixteen days out.

April 5, 1853. Lat. 20° 52′ N.; long. 36° 54′ W. Barometer, 29.95; temperature of air, 75°; of water, 73°. Winds: S. E. by E., E. S. E., E. by N. First and middle parts, a light air; latter, a moderate breeze, with fine weather.

April 6. Lat. 17° 32′ N.; long. 35° 28′ W. Barometer, 29.95; temperature of air, 76°; of water, 75°. Winds: E. N. E., E. N. E., N. E. by E. First part, a moderate breeze; middle and latter parts, fresh breezes.

April 7. Lat. 13° 40′ N.; long. 33° 55′ W. Barometer, 29.80; temperature of air, 75°; of water, 75°. Winds: E. N. E., N. E. by E., E. First and middle parts, a fresh breeze, and clear; latter, a fresh breeze, and cloudy.

April 8. Lat. 10° 2′ N.; long. 32° 10′ W. Barometer, 29.75; temperature of air, 77°; of water, 77½°; of water, 15 feet below surface, 76°. Winds: E., E., E. by N. A fresh breeze and cloudy.

April 9. Lat. 6° 43′ N.; long. 30° 27′ W. Barometer, 29.65; temperature of air, 79°; of water, 79°. Winds: E., E. by N., E. N. E. A fresh breeze and cloudy.

April 10. Lat. 3° 34′ N.; long. 28° 59′ W. Barometer, 29.60; temperature of air, 81°; of water, 81°. Winds: E. by N., E. by N., E. by N. A moderate breeze and cloudy. Lightning in the south during the night. Some tide rips.

April 11. Lat. 14′ N.; long. 28° 56′ W. Barometer, 29.70; temperature of air, 83°; of water, 82°. Winds: E., E., E. S. E. First part, moderate, with fresh squalls of wind and rain; middle and latter parts, moderate and clear.

April 12. Lat. 2° 42′ S.; long. 29° 50′ W. Current, E. S. E., 18 miles. Barometer, 29.65; temperature of air, 84°; of water, 82°; of water below surface, 81°. Winds: S. S. E., S. E. by S., S. E. by S. First part, a light breeze, with frequent and fresh squalls of wind and rain. At 3 P. M. crossed the equator, in about 29° 5′ W. Middle, a light breeze, and clear; latter, fresh trades, and pleasant.

April 13. Lat. 6° 3′ S.; long. 30° 44′ W. Current, E. S. E., 15 miles. Barometer, 29.65; temperature of air, 84°; of water, 83°. Winds: S. E., S. E., S. E. by S. A moderate breeze, and pleasant.

Ship Lantao (Geo. H. Bradbury), New York to San Francisco, sixteen days out.

April 6, 1853. Lat. 20° 5′ N.; long. 39° W. Barometer, 30.30; temperature of air, 74°; of water, 73°. Winds: N. by E., N. E., N. E. Fresh breezes and squally, first part; ends fresh breezes and fine weather.

April 7. Lat. 16° 40′ N.; long. 37° 5′ W. Barometer, 30.20; temperature of air, 75°; of water, 74°. Winds: E. N. E., E. N. E., E. N. E. Strong breezes and flawy. Cloudy at times.

April 8. Lat. 13° 50′ N.; long. 35° 55′ W. Barometer, 30.20. Winds: E. by N. to N. E. by E., E. by N. to N. E. by E., E. by N. to N. E. by E. First part, moderate; latter, fresh and fine. Overcast at times.

April 9. Lat. 11° 5′ N.; long. 33° 50′ W. Barometer, 30.10. Winds: E. N. E. to N. E. by E., E. N. E. to N. E. by E., E. N. E. to N. E. by E. Fresh and fine. Wind unsteady, both in force and direction.

April 10. Lat. 8° 20′ N.; long. 31° 50′ W. Barometer, 30.5; temperature of air, 78°. Winds: E. by N. to N. E. by E., E. by N. to N. E. by E., E. by N. to N. E. by E. Fresh and fine. Tide rips.

April 11. Lat. 5° 25′ N.; long. 30° 20′ W. Barometer, 29.98; temperature of air, 81°. Winds: E. to E. N. E., E. to E. N. E., E. to E. N. E. Fresh and cloudy. Swell from the S. S. E. Upper strata of clouds from S. E. Tide rips.

April 12. Lat. 2° 5′ N.; long. 29° 40′ W. Barometer, 29.90; temperature of air, 82°. Winds: E. to N. N. E., E. to N. N. E., E. to N. N. E. Commences fresh and fine; middle, squally; ends calm, with squally appearances. Swell from south.

April 13. Lat. 1° N.; long. 29° 40′ W. Barometer, 29.85. Winds: S. S. E. to N. by E., S. S. E. to

N. by E., S. S. E. to N. by E. Calms, squalls, wind flying from south to north (by east). Much thunder, lightning, and rain. Swell from southwest.

April 14. Lat. 0° 18′ N.; long. 29° 30′ W. Barometer, 29.95. Winds: N. E. to N., E., and calm; E. by S. to S. E. by E. First part, squally, with rain; middle, light airs, and calms; at midnight, a puff from S. E., and veered to E. N. E., and cleared. Latter part, light and fine.

April 15. Lat. 0° 55′ S.; long. 30° 10′ W. Current, W., 8 miles. Barometer, 29.95; temperature of air, 84°; of water, 84°. Winds: E. S. E. to S. E., E. S. E. to S. E., E. S. E. to S. E. Light airs, and calm S. E. swell; indications of S. E. trades.

April 16. Lat. 2° 05′ S.; long. 31° 20′ W. Current, W., 36 miles. Barometer, 30.00; temperature of air, 84°; of water, 84°. Winds: S. E., calm, calm, and S. E. by S.; squalls, calms, clear, rainy, &c. Fresh breezes from 8 P. M. to midnight; then calm until 10 A. M. After which fresh breezes.

April 17. Lat. 4° 20′ S.; long. 32° 20′ W. Current, W. N. W., 24 miles. Barometer, 30.05; temperature of air, 83°; of water, 83°. Winds: S. E., S. E., S. E. Moderate and fine; swell from south. Passed about 20 miles to windward of Fernando de Noronha.

April 18. Lat. 6° 00′ S.; long. 32° 35′ W. Current, N. W., 24 miles. Barometer, 30.10; temperature of air, 83°; of water, 83°. Winds: S. to S. E., S. to S. E., S. to S. E. First part, moderate and fine; middle, calm and squalls; latter, do. S. E. swell. One squall from N. E.

Bark Parthian (Smith), Richmond, Virginia, to San Francisco, 15 days out.

April 7, 1853. Lat. 18° 55′ N.; long. 34° 25′ W. Barometer, 29.8; temperature of air, 72°; of water, 73°. Winds: N. E., N. E., E. N. E. Fresh trades.

April 8. Lat. 15° 55′ N.; long. 33° 12′ W. Barometer, 29.8; temperature of air, 72°; of water, 73°. Winds: N. E., E. N. E., E. N. E. Fresh trades.

April 9. Lat. 12° 52′ N.; long. 32° 3′ W. Barometer, 29.7; temperature of air, 73°; of water, 73°. Winds: E. N. E., E., E. N. E. Fresh trades.

April 10. Lat. 9° 35′ N.; long. 30° 58′ W. Barometer, 29.7; temperature of air, 76°; of water, 75°. Winds: E. N. E., E., E. N. E. Fresh trades.

April 11. Lat. 6° 09′ N.; long. 29° 50′ W. Barometer, 29.5; temperature of air, 78°; of water, 78°. Wind: E. Squally, and extremely sultry.

April 12. Lat. 2° 45′ N.; long. 29° 1′ W. Barometer, 29.5; temperature of air, 81°; of water, 81°. Wind: E. N. E. Latter part, squally.

April 13. Lat. 1° 20′ N.; long. 28° 57′ W. Barometer, 29.5; temperature of air, 80°; of water, 80°. Winds: N. E., E. S. E., S. S. E. Throughout light winds, with much rain. During the night, thunder and lightning.

April 14. Lat. 0° 37′ N.; long. 29° 32′ W. Barometer, 29.6; temperature of air, 82°; of water, 80°. Winds: E., S. S. E., E. S. E. First part, variable with rain. Rest of the day fine weather. At 8 A. M. St. Paul's, E. N. E., 15 miles distant.

April 15. Lat. 0° 38′ S.; long. 29° 58′ W. Barometer, 29.7; temperature of air, 82°; of water, 80°. Winds: S. E., S. S. E., S. S. E. At 8 P. M. crossed the equator, in 29° 40′ W. Fine weather.

April 16. Lat. 2° 19′ S.; long. 30° 40′ W. Barometer, 29.7; temperature of air, 82°; of water, 82°. Winds: S. E., S. E., S. E.

April 17. Lat. 3° 58′ S.; long. 31° 48′ W. Barometer, 29.6; temperature of air, 82°; of water, 82°. Current, W. N. W., $\frac{3}{4}$ knot per hour. Winds: S. S. E., S. E. by S. At noon, Fernando de Noronha, W. N. W., 35 miles distant.

April 18. Lat. 5° 30′ S.; long. 32° 50′ W. Current, W. N. W., $2\frac{1}{8}$ knots per hour. Barometer, 29.6; temperature of air, 82°; of water, 82°. Winds: S. E. by E., S. S. E., calm. Strong lee current.

Ship Climax (Fred. Howes), New York to San Francisco, eleven days out.

April 8, 1853. Lat. 18° 22′ N.; long. 37° 35′ W. Barometer, 28.00. Winds: E. N. E., E. N. E., E. N. E.; moderate trades with fine weather.

April 9. Lat. 15° 29′ N.; long. 35° 52′ W. Barometer, 28.00. Winds: E. N. E., E., E.; commences strong breezes; middle, squally; latter, light.

April 10. Lat. 12° 48′ N.; long. 33° 43′ W. Barometer, 28.00. Winds: E., E. N. E., E. N. E.; pleasant trades and fine weather.

April 11. Lat. 9° 40′ N.; long. 31° 35′ W. Barometer, $27\frac{10}{12}$. Winds: E., E., E. to N. E.; fine trade winds; all kinds of cross-running seas.

April 12. Lat. 6° 16′ N.; long. 29° 30′ W. Barometer, $27\frac{9}{12}$. Winds: E., E. N. E., E.; commences fresh trades and fine weather; middle and latter parts, the same.

April 13. Lat. 3° 00′ N.; long. 28° 20′ W. Barometer, $27\frac{7}{12}$. Winds: E., E. N. E., N. E.; first part, fine weather and fresh trades; middle, squally appearances all around; heavy clouds to the south; barometer low; indications of a change of wind.

April 14. Lat. 2° 40′ N.; long. 28° 40′ W. Barometer, $27\frac{7}{12}$. Winds: calm, calm, N. E. light; first and middle parts, rainy, with thunder and lightning; latter part, light airs and fine weather. This is the first time the ship has made less than *six knots* the hour since sailing. I hope we shall not be long getting through the doldrums.

April 15. Lat. 1° 37′ N.; long. 28° 50′ W. Barometer, $27\frac{9}{12}$. Winds: N. E., S. E., S. E.; light airs and clear; very warm.

April 16. Lat. 0° 59′ N.; long. 29° 10′ W. Barometer, $27\frac{10}{12}$. Winds: S. E., S. E., S. S. E.; light airs and fine weather; St. Paul's in sight, bearing W. S. W., distant about fifteen miles.

April 17. Lat. 0° 06′ S.; long. 29° 20′ W. Barometer, ——. Winds: E. N. E., S. E. by S., S. E. by S.; fine weather, with passing clouds and baffling flaws from E. N. E. to S. E. We have at last crossed the equator, in nineteen days and seventeen hours, from Boston light-house. Distance to the line, 3,600 miles.

April 18. Lat. 0° 37′ S.; long. 29° 35′ W. Ten miles westerly current. Winds: S. E., calm, S. E.; light airs and calm during the day.

April 19. Lat. 1° 22′ S.; long. 29° 50′ W. Winds: calm, E. N. E., calm; fine weather with baffling airs. When shall I get out of the doldrums? Current, W. N. W., eighteen miles.

April 20. Lat. 3° 02′ S.; long. 30° 00′ W. Winds: S. E., E. N. E., calm; first part, light airs; middle, fresh breezes; latter, calm, with heavy southerly swell.

April 21. Lat. 3° 52′ S.; long. 30° 10′ W. Winds: calm, E. S. E., E. S. E.; commences calm; middle and latter parts, light airs; fine weather.

April 22. Lat. 5° 27′ S.; long. 30° 35′ W. Winds: E. S. E., E. S. E., E. S. E.; first part, light airs; middle, squally with torrents of rain: ends with a steady breeze.

Ship Competitor (Moses Hows), Boston to San Francisco, twelve days out.

April 8, 1853. Lat. 20° 15′ N.; long. 32° 14′ W. Barometer, 29.95; temperature of air, 74°; of water, 74°.5. Winds: N., N., N. Light breezes and pleasant weather.

April 9. Lat. 18° 16′ N.; long. 32° 07′ W. Barometer, 29.95; temperature of air, 74°; of water, 73½°. Wind: N. throughout. Light airs and hot weather.

April 10. Lat. 16° 13′ N.; long. 31° 47′ W. Barometer, 29.95; temperature of air, 81°; of water, 74½°. Winds: N. N. E., N. E., and E. by S. Light airs and warm weather.

April 11. Lat. 13° 24′ N.; long. 31° 40′ W. Barometer, 29.85; temperature of air, 78°; of water, 73°. Wind: E. S. E. throughout.

April 12. Lat. 10° 00′ N.; long. 30° 00′ W. Barometer, 29.85; temperature of air, 82°; of water, 77°. Winds: E. by S., E., and E. by N. Light winds and cloudy; under studding-sails.

April 13. Lat. 6° 31′ N.; long. 28° 20′ W. Barometer, 29.80; temperature of air, 83°; of water, 79°. Wind: E. throughout. Light winds and cloudy.

April 14. Lat. 4° 09′ N.; long. 28° 20′ W. Barometer, 29.80; temperature of air, 91°; of water, 81°. Winds: E., E. N. E., E. N. E. Light winds and cloudy weather.

April 15. Lat. 3° 03′ N.; long. 28° 12′ W. Barometer, 29.85; temperature of air, 91°; of water, 81°. Winds: E. S. E., E. S. E., and S. E. Light and baffling airs, with squally appearance.

April 16. Lat. 2° 17′ N.; long. 28° 11′ W. Barometer, 29.85; temperature of air, 98°; of water, 81°. Winds: calm, E., and calm. Baffling airs from the eastward, and cloudy weather.

April 17. Lat. 1° 35′ N.; long. 28° 10′ W. Barometer, 29.85; temperature of air, 88°; of water, 83°. Winds: calm, calm, and E. S. E. Calms, and light squalls from the eastward.

April 18. Lat. 1° 20′ N.; long. 28° 44′ W. Barometer, 29.90. Current, S. 30° W., 16 miles. Temperature of air, 88°; of water, 81°. Winds: S. by W., S. S. W., and S. S. W. Light airs.

April 19. Lat. 0° 57′ N.; long. 28° 50′ W. Barometer, 29.90; temperature of air, 85°; of water, 81°. Winds: calm throughout.

April 20. Lat. 0° 10′ N.; long. 28° 45′ W. Barometer, 29.93; temperature of air, 85°; of water, 80.° Winds: calm, calm, and E. S. E. Light airs and calm, and cloudy weather.

I have quoted from the Competitor's abstract, merely to illustrate the track of the Climax (p. 392), and to impress navigators with the fact that nothing is to be gained by crossing 20° N. to the east of 35° W.; but, on the contrary, there is generally a loss.

These two vessels crossed that parallel within a day of each other; the Climax, which crossed to the west of that meridian, gaining on her competitor two days to that parallel, and making another gain of another two days thence to the line.

April 21. Lat. 0° 35′ S.; long. 29° 04′ W. Barometer, 29.90. Current, S. 24°, W. 10 miles. Temperature of air, 88°; of water, 80°. Winds: calm throughout. Crossed the line at 3 o'clock P. M.; during the last week I have not taken in royals, and have made but 218 miles.

April 22. Lat. 1° 43′ S.; long. 29° 32′ W. Barometer, 29.85; temperature of air, 84°; of water, 81°. Winds: calm, calm, S. S. E.; first and middle part, calm; latter part, light breezes and cloudy.

April 23. Lat. 4° 47′ S.; long. 30° 30′ W. Barometer, 29.90; temperature of air, 86°; of water, 82°. Winds: S. E. by S., S. E., and S. E. First part, light breezes and passing clouds; middle and latter part, fresh breezes.

April 24. Lat. 7° 48′ S.; long. 32° 34′ W. Barometer, 29.90; temperature of air, 90°; of water, 82°. Winds: S. E. throughout, fresh breezes and fine weather.

Bark Tremont (Joseph Taylor), Boston to Cape Town, eighteen days out.

April 16, 1853. Lat. 19° 50′ N.; long. 35° 22′ W. Current, ½ knot per hour, S. S. W. Barometer, 30.00; temperature of air, 72°; of water, 72°. Winds: E. by N., E. by N., E. by N. Moderate breezes, and clear.

April 17. Lat. 17° 31′ N.; long. 33° 12′ W. Current, ½ knot per hour, S. S. W. Barometer, 30.00; temperature of air, 72°; of water, 72°. Winds: E. by N., E. by N., E. by N. Fair weather, and moderate.

April 18. Lat. 15° 03′ N.; long. 31° 44′ W. Current, 1 knot per hour, W. Barometer, 29.16; temperature of air, 73°; of water, 74°. Winds: E. N. E., E. by N., E. by N.; fair and moderate; some tide rips.

April 19. Lat. 12° 15′ N.; long. 30° 22′ W. Current, ¾ knot per hour, W. Barometer, 29.15; temperature of air, 74°; of water, 74°. Winds: E. by N., E. by N., E. by N.; squally, with some rain and tide rips.

April 20. Lat. 9° 35′ N.; long. 28° 50′ W. Barometer, 29.18; temperature of air, 78°; of water, 76°. Winds: E. N. E., E. N. E., E. N. E.; squally, with some rain and tide rips.

April 21. Lat. 6° 45′ N.; long. 27° 40′ W. Barometer, 29.18; temperature of air, 80°; of water, 78°. Winds: E. N. E., N. E., N. E. Squally, with some rain and tide rips.

April 22. Lat. 4° 03′ N.; long. 27° 15′ W. Barometer, 29.15; temperature of air, 80°; of water, 79°. Winds: N. E., E. N. E., E. N. E. Many tide rips. First part, almost cloudless sky.

April 23. Lat. 2° 00′ N.; long. 26° 45′ W. Barometer, 29.15; temperature of air, 81°; of water, 79°. Winds: N. E., E. N. E., E. N. E. Moderate, and sky overcast; a little rain.

April 24. No observations. Barometer, 29.15; temperature of air, 80°; of water, 79°. Winds: N., E. N. E., E. N. E. Light airs; thunder, and some rain.

April 25. Lat. 1° 21′ S.; long. 26° 20′ W. Barometer, 29.18; temperature of air, 80°; of water, 80°. Winds: E., E. S. E., S. E. Fine weather, and clear sky.

April 26. Lat. 3° 25′ S.; long. 27° 46′ W. Barometer, 29.15; temperature of air, 82°; of water, 81°. Winds: E. S. E., S. E., S. E. by S. Fair and moderate.

April 27. Lat. 5° 22′ S.; long. 28° 41′ W. Barometer, 29.15; temperature of air, 81°; of water, 80°. Winds: S. S. E., S. E., S. E. Fair and moderate.

Bark Golden Era (E. P. Sleeper), New York to Panama, twenty-five days out.

April 19, 1852. Lat. 20° 06′ N.; long. 38° 22′ W. Winds: S., and variable, S. E., S., and variable. Very light variable airs, and calms. A heavy sea from the N. W.

April 20. Lat. 19° 49′ N.; long. 38° 07′ W. Temperature of air, 76°; of water, 76°. Winds: calm, N. N. W., N. N. W. Very light airs and calms.

April 21. Lat. 19° 08′ N.; long. 37° 38′ W. Temperature of air, 77°. Winds: N. N. W., N. N. E., E. N. E., variable. Light airs and calms.

April 22. Lat. 17° 58′ N.; long. 36° 51′ W. Temperature of air, 75°. Winds: E. N. E., E., variable, E. S. E., variable. Light breezes; middle part, light squalls and rain.

April 23. Lat. 16° 8′ N.; long. 35° 37′ W. Temperature of air, 76°; of water, 78°. Winds: E., variable; E. by N. E., variable. Moderate breezes, light squalls, and rain.

April 24. Lat. 13° 40′ N.; long. 33° 56′ W. Barometer, 29.08; temperature of air, 76°; of water, 76°. Winds: E., E. by N., E. N. E.; fresh breezes throughout.

April 25. Lat. 11° 16′ N.; long. 32° 20′ W. Temperature of air, 77°; of water, 77°. Winds: E. N. E., E. by E. N. E., N. E.; good breezes.

April 26. Lat. 8° 58′ N.; long. 30° 39′ W. Temperature of air, 78°; of water, 79°. Wind: E. N. E.; first part, good breezes; middle and latter part, moderate breezes.

April 27. Lat. 6° 42′ N.; long. 29° 07′ W. Temperature of air, 79°; of water, 80°. Winds: E. N. E.; moderate breezes.

April 28. Lat. 4° 23′ N.; long. 27° 55′ W. Temperature of air, 81°; of water, 82°. Winds: E. N. E., N. E. by E., N. E. by E.; moderate breezes.

April 29. Lat. 3° 04′ N.; long. 27° 14′ W. Temperature of air, 82°; of water, 82°. Winds: N. E. by E., N. E. by E., N. E. by N.; light breezes.

April 30. Lat. (D. R.) 1° 48′ N.; long. (D. R.) 27° 15′ W. Temperature of air, 81°; of water, 82°. Winds: N., N., variable, N. W. to E.; first part, very light breezes; middle and latter, showers of rain.

May 1. Lat. 0° 34′ N.; long. 26° 40′ W. Current, E., 24 miles, during the last two days; temperature of air, 84°; water, 83°. Winds: N., N., N. E.; very light breezes, and pleasant.

May 2. Lat. 0° 09′ S.; long. 26° 18′ W. Current, 30 miles, E. S. E., during the day. Winds: N. N. E., calm, S. E.; very light airs, and pleasant.

May 3. Lat. 0° 37′ S.; long. 26° 55′ W. Current, 30 miles E.; temperature of air, 83°. Winds: S. S. E., variable S., variable S. by W., variable; first part, very light airs; middle and latter, light breezes.

Ship White Squall (Samuel Kennedy), New York to San Francisco, fourteen days out.

April 23, 1852. Lat. 21° 29′ N.; long. 33° 7′ W. Current, S., 12 knots per day. Barometer (Aneroid*), 30.55; temperature of air, 78°; of water, 73°. Moderate trades all day; first part, N. E.; middle part, E. N. E.; latter part, E.

April 24. Lat. 17° 32′ N.; long. 31° 47′ W. Current, S. E., 7 knots per day. Barometer, 30.55; temperature of air, 80°; of water, 76°. Fresh trades all day. Winds: E. S. E., E., E. by N.

April 25. Lat. 13° 30′ N.; long. 30° 27′ W. Current S. S. E., 23 knots per day. Barometer, 30.45; temperature of air, 80°; of water, 77°. Winds: E., E. N. E., E. N. E. Fresh trades all day.

April 26. Lat. 9° 50′ N.; long. 29° 23′ W. Barometer, 30.40; temperature of air, 81°; of water, 78°. Moderate trades all day; E. N. E. throughout.

April 27. Lat. 6° 58′ N.; long. 28° 36′ W. Barometer, 30.45; temperature of air, 83°; of water, 80°. Winds: E. N. E., N. E., N. E. Light trades all day; tide rips.

April 28. Lat. 3° 53′ N.; long. 28° 22′ W. Current, S. S. W., 27 knots per day. Barometer, 30.40; temperature of air, 84°; of water, 80°. Winds: E. N. E., N. E., N. N. E. Light trades all day; tide rips.

April 29. Lat. 2° 22′ N.; long. 28° 20′ W. Current, E. S. E., 13 knots per day. Barometer, 30.40; temperature of air, 86°; of water, 82°. Winds: N. N. E., N., N. Light breeze all day.

April 30. Lat. 48′ N.; long. 27° 10′ W. Current east, 32 knots per day. Barometer, 30.35; temperature of air, 87°; of water, 84°. Winds: N., S. S. W., N. Light breeze all day; middle part, rain.

May 1. Lat. 39′ S.; long. 26° 47′ W. Current, E. S. E., 33 knots per day. Barometer, 30.35; temperature of air, 89°; of water, 87°. Winds: N., E. N. E., N. E. Light airs; tide rips.

May 2. Lat. 1° 22′ S.; long. 26° 37′ W. Current, S. E., 27 knots per day. Barometer, 30.30; temperature of air, 91°; of water, 85°. Winds: N., N. E., S. Light airs; tide rips.

May 3. Lat. 1° 50′ S.; long. 27° 36′ W. Current, E. by S., 29 knots per day. Barometer, 30.45; temperature of air, 88°; of water, 86°. Wind: S. S. W. throughout. First part, nearly calm; ends light breezes; rain squalls.

May 4. Lat. 4° 52′ S.; long. 29° 24′ W. Current, S. S. W., 11 knots per day. Barometer, 30.40; temperature of air, 91°; of water, 89°. Winds: S. S. W. and S. E., S. S. E., S. E. Rainy until 1 P. M.; wind hauls to S. E., and clears.

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* Four tenths to be deducted from the Aneroid, for each day up to the 21st of May, for want of adjustment.

Route to Rio, etc.—MAY.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			True.	Per cent.	Average.	Head.	SLANTS FROM N. & E.	SLANTS FROM S. & W.	Fair.	Calms.	
From port to											
39° 11′ N.	70° 00′	E. S. E.	199	9.8	218	2.5	10.8	8.3	78.4	2.1	599
39 11	65 00	E.	238	11.5	464	6.4	12.8	11.2	69.6	2.8	315
37 34	60 00	E. S. E.	254	9.1	277	2.8	6.6	8.8	81.8	1.6	181
35 55	55 00	E. S. E.	259	10.2	285	1.8	9.1	*w* 15.2	73.9	3.6	163
35 55	50 00	E.	243	9.9	267	0.7	15.2	12.4	17.9	2.7	145
35 00	47 17	E. S. E.	144	5.5	152	0.9	0.0	*w* 16.9	82.2	1.7	112
33 06	45 00	S. E.	194	9.1	211	3.3	0.0	*w* 11.5	85.2	1.6	61
30 00	41 23	S. E.	263	14.7	301	3.3	13.9	*w* 19.1	63.7	5.6	151
27 00	40 00	S. S. E.	194	6.5	206	2.6	*w* 10.4	0.0	87.0	2.5	39
25 00	40 00	S.	120	9.4	131	3.4	5.1	5.1	86.4	0.0	60
20 00	37 46	S. S. E.	325	0.3	326	0.0	1.8	0.0	98.2	0.0	54
15 00	35 36	S. S. E.	325	0.8	327	0.0	*w* 4.4	0.0	95.6	0.0	23
10 00	33 29	S. S. E.	325	0.0	325	0.0	0.0	0.0	100.0	0.0	54
5 50	31 24	S. S. E.	325	0.5	325	0.0	*w* 4.8	0.0	95.2	0.0	42
Equator	31 24	S. S. E.	300	0.6	302	0.0	*w* 5.2	1.7	93.1	3.4	115
			3708		3917						
1 00 S.	31 49	S. S. W.	65	2.1	66	0.0	*w* 9.9	0.4	89.7	0.0	264
1 27	32 00	S. S. W.	29	0.0	29	0.0	0.0	0.0	100.0	6.2	15
3 00	32 39	S. S. W.	101	3.3	104	0.0	*w* 16.7	0.0	83.3	0.0	12
3 51	33 00	S. S. W.	55	0.0	55	0.0	0.0	0.0	100.0	0.0	21
5 00	33 28	S. S. W.	75	0.0	75	0.0	0.0	0.0	100.0	0.0	6
6 24	34 00	S. S. W.	84	0.0	84	0.0	0.0	0.0	100.0	0.0	9
7 00	34 15	S. S. W.	39	14.2	45	0.0	*w* 48.9	2.4	48.7	0.0	41
7 00	33 30	E.	44	3.2	45	0.0	0.0	*w* 11.8	88.2	0.0	23
8 13	34 00	S. S. W.	79	32.0	104	13.0	*w* 52.2	0.0	34.8	0.0	23

In this month, and near this route, the calms of the Horse Latitudes are most prevalent between the meridians of 40° and 45°, and the parallels of 32° and 33° N. Between the meridians 25° and 30°, the equatorial calms are most prevalent from 5° north to the line, the greatest prevalence of calms being between 3° and 4° north. Between the meridians of 30° and 35°, the equatorial calms prevail most between 3° and 5° N. Here they extend also a little to the south of the line. In the main, the equatorial calms prevail as you go to the east. When you cross the line to the west of 29°, draw a line from the point of crossing to St. Augustine, and aim to keep to the eastward of it, and for this purpose take advantage of all slants.* This direction applies to every month. You should aim generally to make easting, when easting becomes necessary after crossing the line, before crossing 7° south.

If you can cross 7° S. to the east of 34°, there will probably be no necessity of steering the east course, as by the table. Observe that calms are seldom or never found along this route in this month, south of 1° S.

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* *Vide* p. 329.

The equatorial calms in April, between 25° and 30° W., prevail from 5° S. to 3° N., being most prevalent between 1° S. and 1° N. Between 30° and 35° W., they prevail from 3° N. to 3° S., being most prevalent between 2° N. and the line.

Observe, also, how the winds in this month hang from the southward, in latitude 35° to 30° N., and between the meridians of 40° and 45° W.

Schooner Tennessee (A. B. Lamkin), from Richmond to Pernambuco, twenty-one days out.

April 30, 1853. Lat. 19° 57′ N.; long. 35° 36′ W. Wind: E. throughout; fresh breeze, with occasional showers of rain.

May 1. Lat. 16° 29′ N.; long. 34° 28′ W. Winds: E., E., E. by S.; brisk breezes, with showers of rain.

May 2. Lat. 13° N.; long. 32° 41′ W. Wind: E. throughout; fresh breezes, with passing squalls.

May 3. Lat. 09° 30′ N.; long. 31° 44′ W. Wind: E. throughout; pleasant breezes, and fine weather.

May 4. Lat. 06° 06′ N.; long. 31° 12′ W. Winds: E., E. N. E., and E.; light winds, and cloudy weather.

May 5. No observation. Winds: variable from E. N. E.; light breezes, and showery weather.

May 6. Wind and weather the same. No observation.

May 7. Lat. 3° N.; long. 31° 17′ W. Winds: variable and heavy showers of rain.

May 8. Lat. 1° 30′ N.; long. 31° 41′ W. Winds: calm, calm, S. E. by E.; light baffling winds and calms.

May 9. Lat. 00° 36′ S.; long. 32° 14′ W. Winds: S. E. by S., S. E., and S. E. by S.; light winds, with fine, pleasant weather.

May 10. Lat. 3° 58′ S.; long. 32° 02′ W. Wind: S. E. by S. throughout; light winds with fine weather.

May 11. Lat. 5° 46′ S.; long. 32° 22′ W. Winds: S. E. by S. and S. E.; light air with clear weather.

Ship Victory (O. G. Lane), New York to San Francisco, nineteen days out.

May 10, 1853. Lat. 20° 40′ N.; long. 33° 23′ W. Winds: E., E. S. E., and S. E.; variable breezes and squally.

May 11. Lat. 17° 51′ N.; long. 32° 25′ W. Winds: S. E. by S., E. by S., and E. by S.; fresh breeze and cloudy.

May 12. Lat. 14° 24′ N.; long. 31° 19′ W. Winds: E., E., and E. by N.; fresh breezes and cloudy weather.

May 13. Lat. 10° 06′ N.; long. 30° 15′ W. Wind: E. by N. throughout; fresh breezes and passing clouds.

May 14. Lat. 7° 49′ N.; long. 29° 21′ W. Winds: E. by N., E., and E. by N.; gentle breezes.

May 15. Lat. 4° 38′ N.; long. 28° 19′ W. Winds: E. by N., E. N. E., and E. N. E.; fine breezes and cloudy weather.

May 16. Lat. 3° 30′ N.; long. 28° 25′ W. Wind: E. N. E., variable, and calm; variable breezes and light showers of rain.

May 17. Lat. 1° 44′ N.; long. 29° 37′ W. Winds: S., S. E. by S., and S. E.; moderate breezes and squally weather.

May 18. Lat. 00° 49′ S.; long. 30° 18′ W. Wind: S. E. throughout; fine breezes and pleasant weather. At 4 A. M. passed the equator, twenty-six and a half days; distance sailed 3,890 miles.

May 19. Lat. 3° 18′ S.; long. 31° 04′ W. Winds: S. E. throughout; fine breezes and pleasant weather.

May 20. Lat. 6° 07′ S.; long. 31° 50′ W. Winds: S. E. throughout; fresh breezes and pleasant weather.

Ship Uncle Toby (E. C. Soule), Boston to San Francisco, twenty-one days out.

May 10, 1853. Lat. 20° 49′ N.; long. 31° 57′ W. Winds: E. N. E., E., and E. S. E.; moderate breezes and clear weather.

May 11. Lat. 17° 15′ N.; long. 30° 01′ W. Winds: E. S. E., E. S. E., and E.; strong breezes and clear.

May 12. Lat. 13° 13′ N.; long. 31° 44′ W. Winds: E., E., and E. N. E.; strong breezes throughout.

May 13. Lat. 9° 27′ N.; long. 30° 41′ W. Winds: E. N. E., E. N. E., and E.; strong breezes throughout.

May 14. Lat. 6° 03′ N.; long. 29° 39′ W. Winds: E., E., and E. S. E.; moderate breezes and cloudy weather.

May 15. Lat. 3° 04′ N.; long. 29° 28′ W. Winds: E., N. E., and E. N. E.; fresh breezes and squally.

May 16. Lat. 1° 53′ N.; long. 30° 25′ W. Winds: S. S. E., S. E., and S. S. E.; light variable breezes, and squally.

May 17. Lat. 00° 50′ S.; long. 31° 44′ W. Winds: S. S. E., S. E., and S. S. E.; fresh breezes throughout.

May 18. Lat. 3° 44′ S.; long. no observation. Winds: S. E., E. S. E., and E. S. E. Fresh breezes throughout. At 10 A. M. made Fernando de Noronha.

May 19. Lat. 6° 53′ S.; long. 33° 10′ W. Winds: E. S. E., S. E., and S. E. Light breezes and pleasant; passed close to leeward of Fernando de Noronha.

Flying Cloud (J. P. Creesy), New York to San Francisco, eleven days out.

May 10, 1853. Lat. 20° 50′ N.; long. 38° 47′ W. Winds: S. E. by E., S. E. by E., E. S. E. First part, moderate; middle, rain; latter, squally.

May 11. Lat. 16° 47′ N.; long. 37° 48′ W. Winds: S. E. by E., S. E. by E., S. E. by E. First part, light; middle, squally; latter, fresh and squally.

May 12. Lat. 12° 11′ N.; long. 36° 26′ W. Wind: E. by S. throughout. Fresh and squally.

May 13. Lat. 8° 00′ N.; long. 34° 46′ W. Wind: E. by S. Fresh and squally.

May 14. Lat. 3° 37′ N.; long. 34° 08′ W. Wind: E. S. E. Fresh and squally.

May 15. Lat. 1° 00′ N.; long. 34° 03′ W. Wind: S. E. by E. Light and squally. Civil time, 15′. At 7 P. M. crossed the equator, in long. 34° 20′ W. Seventeen days from Sandy Hook, or 408 hours, averaging nine knots; when determined in short lines, from noon to noon of each day, 3,672 miles. [Distance, as calculated in the tables, 3,708.]

May 16. Lat. 0° 27′ S.; long. 34° 07′ W. Winds: baffling throughout.

May 17. Lat. 3° 11′ S.; long. 34° 42′ W. Wind: S. E. Light breezes and fine weather.

May 18. Lat. 4° 46′ S.; long. 34° 57′ W. Winds: baffling throughout. Beating to the eastward, with light winds and fine weather. Current, W. by N., 46 miles.

May 19. Lat. 2° 31′ S.; long. 33° 41′ W. Winds: S. E., S. E., S. E. by E. Light breezes and fine weather. At 1 hour 15 min., tacked S. by W. ½ W. At 4 hours 20 min., tacked N. E. by E. Stood on this tack 21 hours; lost 135 miles in latitude, and gained 76 miles easting, after having been currented at 82° W., 55 miles.

May 20. Lat. 5° 47′ S.; long. 34° 19′ W. Wind: S. E. by E. Light winds and fine weather. Currented west, 20½ miles. I would here remark, the current sets much stronger to the westward and northward and westward, when close in with the land and shoals about Cape St. Roque, than it does in the offing, say 40 or 50 miles. Should recommend all ships to work to the eastward on the northern limit of the S. E. trades, say between 1° N. lat. and 2° S. lat., when they are so unfortunate as to cross the equator too far west.

This recommendation should be very cautiously adopted. Captain Creesy falls to leeward, crosses the line in 34°, stands boldly on, tacks when he must, and in 22 days out is clear of St. Roque; and yet, notwithstanding this extraordinarily good passage, all navigators are cautioned against following so good an example as he himself set, after having the misfortune to be forced to cross the line so far to leeward as 34°. It is true, no vessel should willingly cross so far to leeward, but cases are not unfrequent of vessels, after crossing in 34°, and even in 37°, having no difficulty in clearing St. Roque. They do this by following the Sailing Directions, which advise them in such cases to stand on and trust to chance for a change of wind, and to luck for favorable slants.

I think that Captain Creesy would have done very unwisely had he, on the 15th, when he found himself to leeward, and on "the northern limits of the southeast trades," attempted, instead of standing on south, as he did, to beat to windward there in the doldrums. If there be any one point upon which I feel myself clear, touching the best course of procedure in such cases, it is in the caution which I have so often given and here repeat, viz: that navigators should not attempt to beat to windward in the doldrums. If

a vessel find herself to leeward in them, and the wind will allow her to lay a course well to windward, as it did the Eagle, let her lay it, but do not attempt to beat in a part of the ocean where you know you are not to have wind enough for beating.

May 21. Lat. 7° 52′ S.; long. 34° 30′ W. Wind: S. E. by E. First part, light breezes and fine weather; middle and latter, faint airs and calms. Current, N. 49° W., 11 miles.

I find the strength of the current about here depends much, if not altogether, upon the direction and velocity of the wind; in crossing with the wind, and *vice versâ.*

Barque Southerner (E. Hooper), New York to San Francisco, nineteen days out.

May 11, 1852. Lat. 14° 24′ N.; long. 39° 05′ W. Strong easterly wind with a head sea.

May 12. Lat. 11° 53′ N.; long. 37° 21′ W. Strong easterly winds, and clear.

May 13. Lat. 9° 19′ N.; long. 35° 53′ W. Fine easterly breezes, and clear.

May 14. Lat. 6° 49′ N.; long. 33° 58′ W. Fresh breezes, at E. by N., and clear.

May 15. Lat. 5° 11′ N.; long. 31° 47′ W. Wind: E. N. E. Fine breezes, and clear.

May 16. Lat. 4° 10′ N.; long. 31° 15′ W. First part, wind all round the compass with rain; middle part, wind S. E. and squally; latter part, east, with rain squalls.

May 17. Lat. 2° 28′ N.; long. 29° 40′ W. First part, squally, with rain; middle and latter parts, fresh breezes from E. to E. S. E., and clear weather.

May 18. Lat. 0° 25′ N.; long. 29° 30′ W. Fine breezes with rain squalls. At 6 A. M. made St. Paul's Island. At 8 A. M. it bore N. E. true, distant about 12 miles. Found (by observation) that Blunt places the island too far east. English books agree with my chronometer.

May 19. Lat. (D. R.) 00° 15′ S.; long. (D. R.) 29° 55′ W.; first part, light breezes from E. S. E.; middle and latter parts, wind all around the compass, accompanied with heavy showers.

May 20. Lat. (D. R.) 1° 00′ S.; long. (D. R.) 30° 29′ W.; light airs, and rain squalls from all points of the compass.

May 21. Lat. (D. R.) 1° 10′ S.; long. (D. R.) 31° 05′ W.; light airs, calms, with rain from all points, but principally N. W.

May 22. Lat. (D. R.) 1° 23′ S.; long. (D R.) 30° 36′ W.; light baffling airs from S. E. to S., with continual rain squalls.

May 23. Lat. 2° 38′ S.; long. 30° 59′ W.; first part, light, baffling airs, and rain squalls; at midnight, took the trades at S. E. by E. Ends with fresh trades, and clear.

May 24. Lat. 4° 05′ S.; long. 32° 56′ W.; fine fresh breezes from S. E. by E., and clear, with a heavy sea from S.

May 25. Lat. 6° 44′ S.; long. 33° 09′ W.; strong gales and a high, irregular sea. Wind: S. E.

May 26. Lat. 7° 10′ S.; long. 33° 18′ W.; strong. S. S. E. gales. At 5, made a tack off shore, and at 4 A. M. on again. Current, N. W., 1 mile per hour.

Barque Ottowa (S. G. Brooks), New York to Rio Grande, Brazil, twenty days out.

May 26, 1853. Lat. 20° 50′ N.; long. 43° 30′ W. Barometer, 30.05; temperature of air, 79°. Winds: E. S. E., E. by S., E.; first part, moderate breezes; middle and latter, light.

May 27. Lat. 18° 55′ N.; long. 42° 18′ W. Barometer, 30.00; temperature of air, 78°. Winds: E., E. N. E., E.; fresh breezes, and squally throughout.

May 28. Lat. 16° 42′ N.; long. 41° 15′ W. Barometer, 29.90; temperature of air, 79°. Winds: E. by S., E., E. by N. to E. by S.; fresh squalls throughout; tumbling sea.

May 29. Lat. 14° 40′ N.; long. 40° 02′ W. Barometer, 29.90; temperature of air, 79°. Winds: E. by S., E. by S., E. by N. to E. by S.; fresh breezes and squally.

May 30. Lat. 12° 44′ N.; long. 38° 31′ W. Barometer, 29.90; temperature of air, 78°. Winds: E. by S., E. by S., E. N. E.; fresh breezes with squalls.

May 31. Lat. 11° 03′ N.; long. 36° 39′ W. Barometer, 29.89; temperature of air, 80°. Winds: E. by N., E. N. E., N. E. by E.; light breezes, and flawy.

June 1. Lat. 9° 18′ N.; long. 34° 44′ W. Barometer, 29.82; temperature of air, 82°. Winds: N. E. by E., E. N. E., E. by N.; moderate breezes; clouds rising from the southward.

June 2. Lat. 7° 34′ N.; long. 33° 08′ W. Barometer, 29.85; temperature of air, 81°. Winds: E. by N., E. by N., W. S. W.; first and middle parts, moderate breezes; latter, light.

June 3. Lat. 6° 00′ N.; long. 32° 37′ W. Barometer, 29.89; temperature of air, 83°. Winds: calm, S. E., E. to E. N. E.; first part, calm; middle, light breezes; latter, fresh.

June 4. Lat. 4° 33′ N.; long. 32° 07′ W. Barometer, 29.90; temperature of air, 82°. Winds: E. to E. N. E., E. to E. S. E. and S. E. Moderate breezes and squally.

June 5. Lat. 2° 33′ N.; long. 33° 20′ W. Current, W. S. W., ¾ of a knot per hour. Barometer, 29.89; temperature of air, 83°. Winds: S. to S. S. E., S. S. E., S. E. Throughout, light breezes; looks like trades.

June 6. Lat. 00° 50′ N.; long. 34° 13′ W. Current, W. by S., 1 knot per hour. Barometer, 29.87; temperature of air, 84°. Winds: S. E. by E., E. S. E., S. E. by E. Light breezes and fine weather; quite smooth.

June 7. Lat. 1° 05′ N.; long. 33° 38′ W. Current, W. by S., $1\frac{2}{10}$ knots per hour. Barometer, 29.85; temperature of air, 83°. Winds: E. S. E., S. E., and S. E. by S. to S. by E. Moderate, and fine weather.

June 8. Lat. 1° 43′ N.; long. 31° 56′ W. Current, W. by N., 1½ knots per hour. Barometer, 29.85; temperature of air, 83°. Winds: S. by E., S., S. by E. First and middle parts, light breezes. Latter, fresh.

June 9. Lat. 1° 24′ N.; long. 32° 21′ W. Barometer, 29.89; temperature of air, 83°. Winds: S. S. E. ½ E., S. E. by S., S. E. Throughout, moderate breezes. *You don't catch me here again.*

June 10. Lat. 00° 24′ S.; long. 33° 06′ W. Current, $1\frac{2}{10}$ knots per hour, W. Barometer, 29.89; temperature of air, 83°. Winds: S. E. by E., S. E., S. E. Throughout, moderate breezes, and squally. Strong currents.

June 11. Lat. 2° 40′ S.; long. 32° 30′ W. Not much current. Barometer, 29.85; temperature of air, 83°. Winds: S. E. by S., S. E. by E., E. Moderate breezes.

June 12. Lat. 4° 54′ S.; long. 32° 04′ W. Barometer, 29.90; temperature of air, 84°. Winds: east, E. N. E., E. by S. Throughout, moderate breezes; stronger in the night.

June. 13. Lat. 7° 07′ S.; long. 32° 40′ W. Barometer, 29.89; temperature of air, 82°. Winds: S. E. by S., S. E., S. E. by S. First part, light breezes; middle and latter, fresh and squally.

Route to Rio, etc.—JUNE.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
							SLANTS FROM				
			True.	Per cent.	Average.	Head.	N'd.	S'd.	Fair.	Calms.	
From New	York to										
39° 11′ N.	70° 00′	E. S. E.	199	10.1	219	2.6	7.8	*w* 11.4	78.2	3.1	349
37 34	65 00	E. S. E.	254	13.4	287	5.3	*w* 10.7	4.0	80.0	1.3	300
35 55	60 00	E. S. E.	259	5.9	272	2.0	2.8	*w* 6.2	89.0	1.2	245
35 00	57 17	E. S. E.	144	8.8	157	2.2	6.3	*w* 10.9	80.6	0.9	233
34 13	55 00	E. S. E.	123	2.0	125	0.0	*w* 10.0	0.0	90.0	20.0	20
32 30	50 00	E. S. E.	271	6.1	287	0.0	10.0	10.0	80.0	0.0	30
30 45	45 00	E. S. E.	276	5.8	292	1.1	2.1	*w* 17.0	79.7	19.7	94
30 00	42 54	E. S. E.	118	19.3	140	6.7	17.4	16.0	59.9	9.7	149
27 28	40 00	S. E.	215	15.0	247	3.3	*w* 22.9	6.6	67.2	4.2	67
25 00	37 15	S. E.	209	16.2	242	6.0	*w* 13.0	9.0	72.0	4.8	100
20 00	35 00	S. S. E.	325	2.6	333	0.0	*w* 9.0	0.0	91.0	1.8	56
15 00	32 50	S. S. E.	325	0.3	326	0.0	0.7	0.9	99.1	0.8	116
10 00	30 43	S. S. E.	325	2.0	331	0.0	*w* 7.5	1.5	91.0	0.0	66
5 00	28 37	S. S. E.	325	17.6	381	5.3	13.2	13.8	67.7	16.0	152
Equator	30 41	S. S. W.	325	8.8	353	2.8	*w* 16.1	2.8	78.3	0.0	106
			3693		3992						
1 00 S.	31 06	S. S. W.	65	3.0	67	0.0	*w* 12.0	0.0	88.0	0.0	171
3 00	31 06	S. S. W.	330	5.8	138	0.0	28.5	0.0	71.5	0.0	21
5 00	32 46	S. S. W.	130	10.0	143	0.0	50.0	0.0	50.0	0.0	12
5 34	33 00	S. S. W.	37	10.0	41	0.0	50.9	0.0	50.0	0.0	12
7 00	33 36	S. S. W.	93	7.7	100	0.0	33.4	0.0	66.6	0.0	21
7 58	34 00	S. S. W.	63	6.6	67	0.0	27.0	0.0	73.0	0.0	37
9 00	34 26	S. S. W.	67	6.4	71	0.0	24.0	2.0	74.0	0.0	50

If the wind should, as it probably will, head you off, after crossing the line to the west of 30°, so as to force you to leeward of 33° before crossing 5° 30′ S., stand E. for a few leagues, or until the wind hauls so as to let you lay up.

Aim to cross the equator near 29°; and do not, if it can be avoided, go to the east of 28° 30′ after crossing 10° N. The farther you go east there, the more prevalent are the calms. Endeavor to cross 30° N. in about 40° W., so you may get to 25° N. by a south course. It is difficult to get to the S. E. between those two parallels. Southwest winds are not uncommon here. Between 10° and the equator, calms are

much more frequent E. of 30° than to the W. of 30°, and they become more prevalent as you go east. Between 25° and 30° W., from 3° to 5° N., are the calm latitudes in this month. See the Charts, Pilot and Track.

Vessels should aim never to get to leeward of the track here laid down after crossing the line. The winds hang obstinately to the southward in June. Therefore, take advantage of all slants for making easting in south latitude, until you get to 9° S. Don't consider yourself too far eastward, if in this month you cross this parallel in 31° W. No calms obtain in June, south of the line, and between 29° W. and the coast. Among 1,000 observations examined in this part of the ocean, for this month, not one calm is recorded.

Between 65° and 70° W., 30° and 33° N., is a great place for calms; also from 25° to 28° N., between 60° and 65°. On the average, you will carry the N. E. trades to 8° or 9° N. Equatorial calms are most prevalent between 6° and 10° N., and 25° and 30° W. But between 30° and 35° W., the calms are most prevalent between 5° and 7° N.

Between 30° and 35° W., you sometimes get the S. W. monsoons, and you are liable to them from 9° to 1° N.

Ship Audubon (C. Whiting), Boston to Canton, seventeen days out.

May 26, 1852. Lat. 21° 01′ N.; long. 38° 34′ W. Winds: light, S. E., E. S. E., E. S. E; weather pleasant.

May 27. Lat. 18° 38′ N.; long. 37° 46′ W. Wind: fresh, E. by S.; weather pleasant.

May 28. Lat. 15° 39′ N.; long. 36° 26′ W. Winds: fresh and flawy, E. by S., E.; weather pleasant.

May 29. Lat. 12° 51′ N.; long. 35° 15′ W. Winds: fresh with squalls, E., E. by N.; weather variable.

May 30. Lat. 10° 00′ N.; long. 33° 43′ W. Winds: fresh and flawy, E. N. E., E. by N.; weather cloudy.

May 31. Lat. 7° 36′ N.; long. 32° 23′ W. Wind: fresh, with squalls, E. by N. E.; weather hazy.

June 1. Lat. 6° 03′ N.; long. 32° 25′ W. Winds: fresh, squally, E., E. S. E., S. E.; weather cloudy, with rain.

June 2. Lat. 4° 49′ N.; long. 32° 00′ W. Winds: S. E., E., moderate, S. S. E. to E. Light and baffling; cloudy weather.

June 3. Lat. 4° 31′ N.; long. 31° 27′ W. Winds: light and baffling; N. E. to E., N. E., E. N. E. to N.; weather pleasant.

June 4. Lat. 3° 49′ N.; long. 31° 07′ W. Winds: light; N., N. E., N. E.; weather clear and pleasant.

June 5. Lat. 3° 28′ N.; long. 31° 12′ W. Winds: light and baffling; W. S. W., S. S. E., S.; weather pleasant, passing squalls.

June 6. Lat. 1° 46′ N.; long. 31° 52′ W. Winds: moderate; S. S. E., S. S. E., S. E.; weather pleasant.

June 7. Lat. 0° 02′ S.; long. 31° 53′ W. Winds: moderate; S. E., E. S. E., E. S. E.; weather pleasant.

June 8. Lat. 2° 14′ S.; long. 32° 12′ W. Winds: moderate; E. S. E. to S. E., by E.; weather pleasant.

June 9. Lat. 3° 25′ S.; long. 32° 20′ W. Winds: moderate; S. E., E. by S., E. S. E.; weather fine; made Fernando de Noronha.

June 10. Lat. 3° 16′ S.; long. 31° 30′ W. Winds: moderate; S. E., S. E. by S., S. E.; weather pleasant.

June 11. Lat. 5° 20′ S.; long. 31° 27′ W. Winds: fresh; S. E., S. S. E., S. E.; weather pleasant.

Ship Milton (Freeman), Boston to Madras, twenty-three days out.

June 7, 1851. Lat. 20° 31′ N.; long. 35° 50′ W. Fresh winds with occasional squalls; E. S. E., S. E.

June 8. Lat. 18° 55′ N.; long. 34° 40′ W. Fresh winds and clear weather; E. to E. S. E.

June 9. Lat. 16° 53′ N.; long. 33° 31′ W. Fresh breezes and passing clouds; E. by N.

June 10. Lat. 14° 48′ N.; long. 31° 33′ W. Fresh breezes and hazy weather; E. by N.

June 11. Lat. 12° 48′ N.; long. 33° 12′ W. Fine breezes and pleasant; E., E. by N.

June 12. Lat. 11° 05′ N.; long. 28° 23′ W. Fine wind and pleasant; E. by N.

June 13. Lat. 9° 16′ N.; long. 27° 01′ W. Fine breezes and squally; E., E. by N.

June 14. Lat. 7° 47′ N.; long. 25° 48′ W. Moderate breezes with occasional squalls; E., E. N. E., N. E.

June 15. Lat. 6° 45′ N.; long. 25° 10′ W. Light airs and pleasant; N. E., E.

June 16. Lat. 5° 57′ N.; long. 25° 18′ W. Light baffling airs; calms, thunder and lightning; N. E., baffling.

June 17. Lat. 5° 17′ N.; long. 26° 02′ W. Light airs first part; latter, heavy squalls with rain. South, variable.

June 18. Lat. 4° 47′ N.; long. 25° 11′ W. Calms and squalls, first and middle part; latter part, fine weather; calm, S. by E.

June 19. Lat. 3° 18′ N.; long. 26° 02′ W. Gentle breezes and pleasant; S. by E.

June 20. Lat. 1° 36′ N.; long. 27° 21′ W. Fine weather; S. S. E.

June 21. Lat. 0° 24′ S.; long. 28° 26′ W. Fine weather; S. E.

June 22. Lat. 2° 52′ S.; long. 28° 44′ W. Fine weather; moderate breezes; S. E. by E., S. E. by S., S. E.

June 23. Lat. 5° 17′ S.; long. 28° 54′ W. Fine weather; S. E.

Ship Messenger (Frank Smith), New York to California, eleven days out.

June 13, 1852. Lat. 19° 37′ N.; long. 38° 46′ W. Winds: east throughout. First part, fine winds and weather; middle and latter parts, light and squally.

June 14. Lat. 16° 18′ N.; long. 38° 44′ W. Moderate breeze, E. S. E., S. E. by E., E. S. E. Occasional squalls.

June 15. Lat. 13° 30′ N.; long. 36° 44′ W. First part, light breezes and squally; latter, moderate and fair, E., E. to E. by N., E. N. E.

June 16. Lat. 11° 00′ N.; long. 34° 39′ W. First part, fine breezes; middle and latter, light, at E. by N. throughout.

June 17. Lat. 9° 00′ N.; long. 31° 49′ W. Light winds and fair weather, E. by N. to E. N. E.

June 18. Lat. 7° 18′ N.; long. 30° 24′ W. First part, moderate breezes; latter, baffling airs and calms; E. N. E.; northerly, baffling.

June 19. Lat. 7° 08′ N.; long. 29° 50′ W. First part, calm and cloudy; latter part, light breeze from southward.

June 20. Lat. 6° 28′ N.; long. 29° 10′ W. First part, light airs, S. by W., and clear; middle and latter part, calm with heavy rain.

June 21. Lat. 5° 51′ N.; long. 25° 43′ W. First part, calm with showers; middle and latter, light breeze, S. by W., S. S. W.

June 22. Lat. 4° 27′ N.; long. 27° 53′ W. Moderate breezes and clear; S. by W., S., S. by E.

June 23. Lat. 3° 26′ N.; long. 29° 20′ W. Very light airs and calms; S. by E., calm S.

June 24. Lat. 2° 25′ N.; long. 31° 05′ W. Light airs; S. by E., calm, S. S. E.

June 25. Lat. 0° 30° N.; long. 31° 54′ W. Light breezes; S. S. E., S. E. by S., S. E. to S. E. by E.

June 26. Lat. 2° 12′ S.; long. 31° 56′ W. Moderate breezes and squally, S. E. by E., E. S. E.

June 27. Lat. 5° 04′ S.; long. 32° 40′ W. Light winds in first and middle part, S. E. by E.; latter part, fine breezes, S. E. by E.

Ship Eliza Mallory (John E. Williams), New York to San Francisco, sixteen days out.

June 4, 1852. Lat. 21° 24′ N.; long. 35° 14′ W. Barometer, 30.05; temperature of air, 78°. Winds: E., E. N. E., E. N. E. Light and baffling.

June 5. Lat. 18° 33′ N.; long. 34° 00′ W. Barometer, 30.00; temperature of air, 78°. Winds: E. N. E., E., E. First part, light breezes; middle and latter, strong. Came through a tide rip.

June, 6. Lat. 15° 47′ N.; long. 32° 39′ W. Barometer, 29.95; temperature of air, 78°. Winds: E. N. E., E., E. by S. First part, strong breezes; middle and latter, squally.

June 7. Lat. 12° 50′ N.; long. 31° 16′ W. Barometer, 29.95; temperature of air, 78°. Winds: E. S. E., E., E. N. E. Strong breezes.

June 8. Lat. 10° 27′ N.; long. 30° 08′ W. Barometer, 29.9; temperature of air, 78°. Winds: east. Strong breezes and rain squalls. Came through tide rips. Current setting to the eastward.

June 9. Lat. 7° 54′ N.; long. 29° 8′ W. Current, eastwardly. Barometer, 29.9; temperature of air, 82°. Winds: E. by N. Strong breezes.

June 10. Lat. 7° 8′ N.; long. 28° 40′ W. Current, to the eastward. Barometer, 29.9; temperature of air, 82°. Winds: E. N. E., and calm. First part, strong, with rain squalls; middle and latter, calm and rainy.

June 11. No observation. Current, to the eastward. Barometer, 29.9; temperature of air, 78°. Winds: S. S. W., and baffling. First part, squalls from S. W.; middle and latter, rain squalls from all quarters.

June 12. Lat. 6° 40′ N.; long. 27° 23′ W. Easterly current. Barometer, 29.9; temperature of air, 78°. Winds: S. W. Wind baffling from west to S. W., with rain squalls. Heavy sea from S. W.

June 13. Lat. 6° N.; long. 27° 22′ W. Easterly current. Barometer, 29.95; temperature of air, 82°. Winds: S. W.; calm, S. E. First part, rain squalls; middle, calm; latter, light.

June 14. Lat. 5° 18′ N.; long. 27° 21′ W. Barometer, 29.90. Temperature of air, 80°. Wind: S. E. First part, light; middle and latter, light and squally.

June 15. Lat. 3° 45′ N.; long. 28° 30′ W. Barometer, 29.9; temperature of air, 82°. Winds: S. S. E., S. S. E., S. by E. First part, light and rainy; middle, squally; latter, strong.

June 16. Lat. 2° N.; long. 30° 30′ W. Barometer, 29.9; temperature of air, 80°. Winds: S. by E., S. E. by S., S. S. E. First part, strong; middle and latter, moderate.

June 17. Lat. 1° 40′ N.; long. 31° 37′ W. Westerly current. Barometer, 29.9; temperature of air, 81°. Wind: S. S. E. Light winds. At 8 A. M. came through a tide rip.

June 18. Lat. 2° N.; long. 30° 54′ W. Westerly current. Barometer, 30; temperature of air, 80°. Winds: baffling, S. S. E., S. S. E. Strong current going to the westward. Tacked to the eastward.

June 19. Lat. 15′ S.; long. 31° 13′ W. Westerly current. Barometer, 30; temperature of air, 80°. Winds: S. E. by S., S. E., S. E. by E.; light. Tacked ship; came through tide rips.

Ship N. B. Palmer (C. P. Low), New York to San Francisco, thirteen days out.

June 4, 1852. Lat. 22° 3′ N.; long. 32° 29′ W. Barometer, 30.30. Winds: north, N. E., and E. S. E. Moderate breeze, and pleasant.

June 5. Lat. 18° 14′ N.; long. 31° 24′ W. Barometer, 30.30. Wind: E. S. E.

June 6. Lat. 14° 21′ N.; long. 29° 48′ W. Barometer, 30.30. Wind: E. S. E. Pleasant trades.

June 7. Lat. 11° 16′ N.; long. 28° 28′ W. Barometer, 30.20. Wind: E. by S. Pleasant trades.

June 8. Lat. 8° 44′ N.; long. 26° 54′ W. Barometer, 30.20. Wind: E. by S. Pleasant trades. At 2 A. M. came up with and passed the clipper ship Gazelle, which sailed 6 days before us.

June 9. Lat. 7° 32′ N.; long. 26° 30′ W. Barometer, 30.20. Winds: E. by S. Light airs and calms. Gazelle twelve miles astern.

June 10. Lat. 7° 20′ N.; long. 25° 52′ W. Barometer, 30.30. Winds: E., S., N. Light airs and calms.

June 11. Lat. 6° 30′ N.; long. 24° 55′ W. Barometer, 30.30. Winds: S., S. S. W., S. S. E. Light airs and calms.

June 12. Lat. 5° 49′ N.; long. 25° 14′ W. Barometer, 30.1. Winds: S. S. E. Light airs and calms.

June 13. Lat. 3° 45′ N.; long. 26° 40′ W. Barometer, 30.1. Winds: S. by E., S. S. E., S. E. by S. Moderate breezes from S. to S. E. by S. Gazelle out of sight astern.

June 14. Lat. 1° 16′ N.; long. 28° 10′ W. Barometer, 30.20. Wind: S. S. E. Moderate breezes.

June 15. Lat. 1° 28′ S.; long. 29° 32′ W. Barometer, 30.30. Wind: S. E. by S. Moderate breezes, and cloudy.

June 16. Lat. 4° 24′ S.; long. 30° 38′ W. Barometer, 30.30. Wind: E. S. E.

Ship Oneida (William A. Creesy), New York to China, nineteen days out.

June 6, 1852. Lat. 15° 53′ N.; long. 31° 25′ W. Barometer, 30.00; temperature of air, 75°; of water, 75°. Winds: E. by S., E. by S., E. by S. Fresh breezes and hazy weather; sun obscured.

June 7. Lat. 12° 49′ N.; long. 30° 37′ W. Barometer, 30; temperature of air, 76°; of water, 75°. Winds: E., E., E. Moderate breezes and squally, with showers of rain; heavy dew.

June 8. Lat. 10° 31′ N.; long. 29° 20′ W. Barometer, 29.95; temperature of air, 76°; of water, 75°. Winds: E., E., E., gentle. Night-showers; latter pleasant. S. E. sea.

June 9. Lat. 8° 3′ N.; long. 27° 50′ W. Barometer, 29.95; temperature of air, 82°; of water, 79°. Winds: E., E. by N., E. by N. Overcast; heavy clouds hanging at the S. E. and S. Ends rainy.

June 10. Lat. 7° 16′ N.; long. 27° 40′ W. Barometer, 29.95; temperature of air, 77°; of water, 80°. Winds: E., calm, calm. Heavy rains; frequent airs from all points, but generally calm. Saw a ship, apparently a clipper, bound same way.

June 11. Lat. 6° 58′ N.; long. 37° 30′ W. Barometer, 29.95; temperature of air, 81°; of water, 81°. Winds: calm, S., S. E., light airs from S. to S. E., and S. W., and calm, with heavy rains. Ends pleasant. Signalized ship Tartar, from New York, May 12, for Canton.

June 12. Lat. 6° 18′ N.; long. 27° 5′ W. Barometer, 29.95; temperature of air, 79°; of water, 81°. Winds: calm N. N. W., calm N. N. W., calm, calm, most of the time. Cats-paws from all points; frequent rains.

June 13. Lat. 5° 34′ N.; long. 26° 41′ W. Barometer, 29.95; temperature of air, 82°; of water, 81°. Winds: calm, calm, S. E.; first and second calm, baffling, and rainy; latter, light airs from S. E.

June 14. Lat. 4° 44′ N.; long. 26° 50′ W. Barometer, 29.95; temperature of air, 82°; of water, 81°. Winds: S. E., calm, S. E.; first and second, pleasant; latter, hanging squalls and rains.

June 15. Lat. 3° 10′ N.; long. 27° 49′ W. Barometer, 29.95; temperature of air, 79°; of water, 81°. Winds: S. S. E., S. S. E., S. S. E.; first part, rainy and squally; night and morning, steady trades.

June 16. Lat. 57′ N.; long. 29° 28′ W. Barometer, 29.95; temperature of air, 80°; of water, 80°. Winds: S. S. E., S. E., S. S. E.; pleasant, with gentle breezes. Made Saint Paul's Rocks E. by S., four or five miles.

June 17. Lat. 1° S.; long. 30° 11′ W. Barometer, 29.95; temperature of air, 79°; of water, 77°. Winds: S. E. by S., S. E., S. E. Pleasant, with gentle breezes at times, approximating to a calm.

June 18. Lat. 2° 46′ S.; long. 30° 25′ W. Current, E. N. E., half knot per hour. Barometer, 29.95; temperature of air, 79°; of water, 79°. Winds: S. E., E. S. E., E. S. E.; first and second, very light; latter, brisk breezes, squally appearances.

June 19. Lat. 4° 26′ S.; long. 30° 45′ W. Barometer, 29.95; temperature of air, 79; of water, 79°. Winds: S. E. by S., S. S. E., S. E. Squally, with showers of rain. Stood E. twenty miles.

June 20. Lat. 7° S.; long. 32° 11′ W. Barometer, 30; temperature of air, 80°; of water, 79°. Winds: S. S. E., E. by S., S. S. E. Brisk breezes, and fine. Flying fish.

June 21. Lat. 9° 2′ S.; long. 33° 55′ W. Current, half knot per hour. Barometer, 30; temperature of air, 80°; of water, 79°. Winds: S. S. E., S. S. E., S. S. E. Brisk breezes, and cloudy throughout.

Route No. 1, *to Rio, etc.*—July. (For fast Vessels.)

Latitude.	Longitude.	Course.	Distances. True.	Distances. Per cent.	Distances. Average.	Winds; per cent. Head.	Slants from N'd or E'd.	Slants from S'd or W'd.	Fair.	Calms.	Total No. observations.
From Sandy	Hook to										
39° 11′ N.	70° 00	E. S. E.	199	11.4	222	2.2	11.8	10.8	75.2	4.0	310
37 33	65 00	E. S. E.	256	5.4	269	0.2	8.2	6.5	85.1	10.7	411
35 54	60 00	E. S. E.	259	7.7	278	2.6	4.7	6.9	85.8	7.5	234
35 00	57 21	E. S. E.	141	5.3	148	0.4	4.7	*w* 7.9	87.9	3.4	256
34 12	55 00	E. S. E.	126	19.2	150	6.2	*w* 18.5	10.8	64.5	12.2	65
32 28	50 00	E. S. E.	272	20.6	297	7.2	9.6	*w* 22.8	60.2	0.0	84
30 00	50 00	S.	148	14.4	173	1.7	*w* 19.9	17.4	61.0	1.7	116
25 00	50 00	S.	300	10.6	352	5.3	*w* 10.5	0.0	84.2	5.0	19
20 24	45 00	S. E.	390	3.5	402	0.0	*w* 0.0	17.4	82.6	0.0	23
20 00	44 34	S. E.	34	5.1	36	0.0	*w* 18.0	0.0	82.0	0.0	28
15 40	40 00	S. E.	368	5.8	389	0.0	*w* 28.7	0.0	71.3	0.0	28
15 00	39 10	S. E.	57	11.5	57	0.0	*w* 1.4	0.0	98.6	0.0	72
10 48	35 00	S. E.	356	5.9	377	0.0	*w* 25.0	0.0	75.0	7.2	64
10 00	34 40	S. S. E.	52	6.4	55	1.0	*w* 8.2	1.0	89.8	5.8	98
8 06	30 00	E. S. E.	299	11.7	334	1.0	*w* 18.6	15.5	61.9	13.4	97
6 03	25 00	E. S. E.	322	14.2	367	2.4	15.6	*w* 18.0	64.0 }	10.7	167
5 00	25 26	S. S. W.	68	29.8	88	8.4	*w* 35.4	12.6	44.6 }		
Equator	27 30	S. S. W.	325	7.4	348	1.3	*w* 21.9	0.0	76.8	0.0	78
			3972		4322						
3 36 S.	29 00	S. S. W.	234	6.9	348	2.0	*w* 21.0	2.0	75.0	0.0	401
4 36	30 00	S. W.	85	0.0	85	0.0	*w* 39.8	0.0	69.2	0.0	35
5 00	30 10	S. S. W.	26	2.9	27	0.0	14.2	0.0	85.8	0.0	21
5 50	31 00	S. W.	70	0.0	70	0.0	0.0	0.0	100.0	0.0	33
7 00	31 30	S. S. W.	76	5.0	80	0.0	24.9	0.0	75.1	0.0	12
7 30	32 00	S. W.	42	0.6	42	0.0	3.4	0.0	96.6	0.0	29
8 29	33 00	S. W.	84	2.9	86	0.0	14.4	0.0	85.6	0.0	21
9 00	33 51	S. W.	44	1.9	45	0.0	9.6	0.0	90.4	0.0	42
10 14	34 00	S. S. W.	80	7.2	86	0.0	26.0	0.0	74.0	5.0	39
11 00	34 19	S. S. W.	50	4.2	52	0.0	23.4	0.0	76.6	0.0	39

The difficulties for this month consist in calms and baffling winds, in certain regions, which it is necessary to avoid. I have, therefore, given two tracks for this month, viz: one for bold navigators and fast-sailing vessels, that can lay up within six points of the wind; and the other for dull sailers, that cannot do well close-hauled. Both tracks avoid the calms of the horse latitudes.

There is not much difference between them as they are here given, in point of average sailing distance. The difference consists in better working breezes by route No. 1, than the other, and I now confine myself to this route, viz: No. 1.

In taking this route, if you keep much to the east of the track, say between the parallels of 35° and 30° N., you will get into the calms of the horse latitudes. See, by the Trade-Wind Charts, where these calms most prevail along this route, and at this season.

After reaching the meridian of 50° W., south is given as the course which a vessel will make on the *average* thence to the parallel of 25°.

But it should be recollected that the tracks given in these Directions, and which every navigator who intends to be guided by them is recommended to project on his chart, are in no case the track which the vessel herself is expected actually to make. Suppose a large number of vessels at different times should take this route as their guide, the mean of all their tracks would be represented by the route which I recommend; though perhaps it would not represent the track of a single vessel taken separately. Some would be on one side, some on another; some would cross it in one place and some in another.

It is difficult to get navigators to comprehend this. Many of them think that, to go the routes recommended by me, they must actually run on the lines which I have drawn to serve merely as guides for them, and for the purpose of my own convenience in illustration.

Vessels that attempt to follow these routes, will sometimes find themselves hundreds of miles on one side or the other of the track, as projected; and when they find themselves so driven off from the track as laid down in the books, they should not attempt to get back upon the line itself, as though it were a channel way, but taking the direction in which it lies as a guide, and consulting the charts with which they are supplied, they should shape their course, and be governed accordingly.

Every track that I have drawn, shows that head winds may be expected along it; and when these head winds are encountered, the vessel so encountering must expect to be turned aside; and whether she should beat or not, or stand off altogether upon this or that track, the master must decide; and he should be governed in his decision by the Sailing Directions and the Charts themselves.

With this general explanation for *all* the routes, navigators who try this July route, will perceive that I do not recommend that they should, after reaching the meridian of 50° W., actually stretch away due south for 500 miles until they reach the parallel of 25° N., where the wind will allow them to lay up to the southward and eastward.

Suppose that a vessel on this route should, on reaching the meridian of 50°, near lat. 32° 28′, have the wind to come out from S. E.—as she will find it to do, on the average, 12 times in 100—she should not, in this case, stand to the northward and eastward, because she would then run up into a part of the

ocean where the calms and light airs of the horse latitudes are most vexatious. If she cannot lie south, she should stand down to the southward and westward until the wind hauls, or until she can reach the parallel of 31°, and then go about, taking care not to recross the parallel of 32° and to the west of 45.°

After crossing 30° N., strive not to fall to the westward of the projected track. Consider yourself in the best possible position if you can cross the parallel of 25° N. between 40° and 45°, or the parallel of 20° between 35° and 40°. From either of these positions, you will have no difficulty in reaching the meridian of 30° or 31° between the parallels of 9° and 12° N., where you will lose the N. E. trades; you will then take the equatorial calms, and they may hang on you obstinately, *if you go much farther to the east;* but you will seldom or never carry them with you below 6° N. Cross 6° N. by the shortest possible course. Losing these calms, you will generally get the S. E. trades; for to the west of 30°, the S. W. monsoons seldom blow—though they do sometimes; to the east of 30° they blow quite constantly in July. To the east of 30°, the equatorial calms prevail from 15° N. to 8° N., and you will be liable to the S. W. monsoons from 11° to 2° N. Hence, you will observe that it is important you should, if the winds will allow you, cross the equatorial doldrums about 30° W., and not go further east than 27° if you can possibly avoid it.

After crossing the line and getting the S. E. trades, if you should find yourself unable to clear the land, stand on boldly to the southward, unless the wind should slant so as to allow you to lay well up to the eastward on the other tack, until you cross 5° S. to the west of 33°. Between this parallel and 9° S. you can make either a south or an east course good on the average twice out of three, and in some regions three times in four; or even, when you get near the land, four times in five. It is better to take the chances of these slants, than it is to attempt to make your easting in the doldrums north of the line. If a vessel strike these calms to the east of 27° west, she may consider herself lucky if she gets clear of them in less than a week or ten days. Don't fear to pass west of Fernando de Noronha.

July is an unfavorable month for quick passages, let a vessel take what route she will.

Route No. 2, *to Rio, etc.*—JULY.

Latitude.	Longitude.	Course.	DISTANCES. Direct.	Per cent.	True.	WINDS; PER CENT. Head.	SLANTS FROM N'd or E'd.	S'd or W'd.	Fair.	Calms.	Total No. observations.
From Sandy	Hook to										
39° 11′ N.	70° 00′	E.S.E.	199	11.4	222	2.2	11.8	10.8	75.2	4.0	310
37 33	65 00	E.S.E.	256	5.4	269	0.2	8.2	6.5	85.1	10.7	411
37 33	60 00	E.	238	9.0	259	3.4	*w* 8.6	5.2	82.8	7.5	234
37 33	55 00	E.	238	9.0	259	4.3	3.5	*w* 6.3	85.0	3.4	256
37 33	50 00	E.	238	6.7	254	1.1	4.9	*w* 9.0	84.1	5.8	262
37 33	45 00	E.	238	8.2	257	2.9	1.2	*w* 10.2	85.7	2.8	243
35 54	40 00	E.S.E.	259	5.9	274	1.6	2.0	*w* 11.1	85.3	3.3	244
35 00	38 54	S.E.	77	14.9	88	3.6	9.0	*w* 19.5	67.9	5.5	329
31 41	35 00	S.E.	274	9.6	300	1.0	*w* 16.0	10.0	73.0	3.8	100
30 00	34 09	S.S.E.	115	6.2	122	0.0	*w* 17.6	11.0	71.4	8.3	46
25 00	31 49	S.S.E.	325	8.5	352	3.0	7.0	8.0	82.0	3.0	98
21 00	30 00	S.S.E.	260	0.3	261	0.0	1.5	0.0	98.5	0.0	130
20 00	29 34	S.S.E.	.65	0.3	65	0.0	0.0	2.1	97.9	1.4	142
15 00	27 24	S.S.E.	325	0.5	327	0.0	2.5	0.0	97.5	1.8	163
10 00	25 17	S.S.E.	325	4.3	339	0.6	*w* 8.2	5.2	86.0	9.2	158
	Thence	S. or S.S.E.	to intersection of track No. 1.								

This route is intended for dull sailers and timid navigators. Do not cross 35° N., to the west of 45°; nor 33° N., to the west of 40°. After crossing 30° N. in about 33°, you have, as the track shows, all the chances nearly, of fair winds, in your favor, until you get between 13° and 8° N.; between which parallels, if you be between the meridians of 25° and 30°, you may expect to lose the N. E. trades, and then to contend with southerly winds, light airs, and calms (if between these two meridians), till you get between 5° and 2° N., where the S. E. trades will be found. The getting from the N. E. into the S. E. trades is the difficult part of the passage, and the farther you go east, the more difficult this is. In July, you can carry the N. E. trades two or three degrees farther down, by keeping between the meridians of 30° and 35°, than you are liable to do between the meridians of 25° and 30°. In like manner, you will get the S. E. trades farther to the north between the two former, than you will between the two latter meridians. And in this fact is the great secret of the advantage to be gained by keeping to the west.

Ship Albany (L. B. Gorham), from New York to San Francisco, twenty-one days out.

June 24, 1852. Lat. 20° 04′ N.; long. 40° 29′ W. Winds: E. by N., E. by N., E. by N. Fine breezes and weather.

June 25. Lat. 19° 14′ N.; long. 39° 30′ W. Winds: E., and E. by N. Moderate breezes and passing clouds.

June 26. No observation. Wind: E. by N. Fresh breezes, with fresh squalls of rain.

June 27. Lat. 15° 43′ N.; long. 36° 45′ W. Wind: E. by N. Fresh breezes and squally.

June 28. Lat. 14° 38′ N.; long. 35° 00′ W. Wind: E. N. E. Moderate breezes with fresh squalls.

June 29. Lat. 12° 53′ N.; long. 33° 25′ W. Wind: E. by N. Squally with rain.

June 30. Lat. 11° 27′ N.; long. 31° 36′ W. Wind: E.N.E. Moderate breezes and pleasant.

July 1. Lat. 9° 57′ N.; long. 27° 32′ W. Wind: E. N. E. Fine breezes and clear weather.

July 2. Lat. 9° 07′ N.; long. 29° 13′ W. Winds: N. E. to S. E. Light, variable winds, and calm with rain.

[This ship is now entering the doldrums, and the region of southwardly monsoons. That tack is the best, which, under these circumstances, would enable her to make most southing. She was baffled in this region until the 19th, seventeen days; for it was not until the 19th that she cleared the rains which mark this region.]

July 3. Lat. 8° 59′ N.; long. 28° 16′ W. Winds: variable, S., and S. by W. Light air and squally, with rain.

July 4. Lat. 8° 38′ N.; long. 27° 00′ W. Wind: S. S. W. Light breezes and fine weather.

July 5. Lat. 7° 40′ N.; long. 26° 00′ W. Winds: S. W., calm, and S. W.; light airs and calm.

July 6. Lat. 6° 53′ N.; long. 29° 39′ W. Winds: S. W. by S., S. S. W., and S.; moderate and passing clouds.

July 7. Lat. 6° 07′ N.; long. 26° 10′ W. Winds: S. S. E., S. E. by S.; light and hazy.

July 8. Lat. 5° 07′ N.; long. 26° 12′ W. Winds: S. S. E., S. S. E., S. E. by S.; moderate and clear.

July 9. Lat. 4° 04′ N.; long. 26° 57′ W. Wind: S. E. by S.; moderate and clear.

July 10. Lat. 3° 24′ N.; long. 28° 25′ W. Wind: S. E. by S.; gentle breezes and fine weather.

July 11. Lat. 3° 42′ N.; long. 28° 00′ W. Wind: S. S. W.; moderate and cloudy.

July 12. Lat. 4° 04′ N.; long. 27° 00′ W. Wind: S. by W. to S.; moderate and cloudy.

July 13. Lat. 3° 21′ N.; long. 27° 28′ W. Winds: S., S. S. E., S. E. by S.; moderate and pleasant weather.

July 14. Lat. 2° 01′ N.; long. 28° 40′ W. Winds: S. E. by S., S. E., S. E. by E.; gentle breezes and pleasant.

July 15. Lat. 1° 38′ N.; long. 29° 45′ W. Winds: S. E., S. E., and S. by E.; gentle and light airs, and fine weather.

July 16. Lat. 2° 04′ N.; long. 29° 30′ W. Winds: S. S. E., S. by E., and S.; light breeze and clear.

July 17. Lat. 2° 24′ N.; long. 29° 25′ W. Winds: S., S. S. E., S. E. by S.; light winds and clear.

July 18. Lat. 2° 42′ N.; long. 29° 20′ W. Winds: S. S. E., S. E. by S., S. E. by E.; light breeze and squally with rain; latter part, fine breezes and clear.

July 19. Lat. 1° 03′ N.; long. 30° 26′ W. Winds: E. S. E., S. E., S. E. by E.; moderate breezes and clear.

July 20. Lat. 0° 57′ S.; long. 31° 05′ W. Winds: S. E., and E. S. E.; moderate and clear.

July 21. Lat. 2° 55′ S.; long. 31° 03′ W. Wind: E. S. E.; moderate and pleasant.

July 22. Lat. 4° 57′ S.; long. 31° 24′ W. Winds: S. E. by E., E. S. E.; moderate and rain.

July 23. Lat. 7° 08′ S.; long. 31° 43′ W. Winds: S. E. to E. S. E.; moderate and pleasant; latter part, fresh breezes and squally.

Ship Helena (F. H. Cave), New York to Port Philip, fifteen days out.

June 25, 1852. Lat. 21° 18′ N.; long. 33° 18′ W. Strong trades with passing clouds; E. by S., E.

June 26. Lat. 17° 14′ N.; long. 32° 37′ W. Strong trades with passing clouds, east.

June 27. Lat. 13° 25′ N.; long. 31° 65′ W. Moderate winds, smoky weather, east.

June 28. Lat. 10° 12′ N.; long. 31° 28′ W. Moderate breezes, east.

June 29. Sun obscure; lost the trades; middle part, baffling winds and calms, with storms of rain; ends thick and rainy.

June 30. Lat. 7° 13′ N.; long. 30° 29′ W. Begins squally with rain, wind baffling; at midnight, heavy rains; 9 A. M. weather more clear with passing clouds, W. S. W.

July 1. Lat. 6° 24′ N.; long. 29° 39′ W. Baffling winds with rain, W. S. W., S. W., S. S. W.

July 2. Lat. 5° 31′ N.; long. 29° 00′ W. Baffling winds, with heavy rains, S. S. W.

July 3. Lat. 3° 41′ N.; long. 29° 40° W. First part, baffling winds. Ends with fine breezes; S. S. W., S., S. S. E.

July 4. Lat. 0° 36′ N.; long. 31° 32′ W. Strong trades: S. E. by S., S. E.

Compare the track of the Helena and Sabine (p. 414), with the track of the Albany (p. 412: [illegible]).

They all came along about the same time. The two former did not go east of 29°, and were detained by the baffling winds of the doldrums, only two or three days each, against the Albany's two or three weeks.

July 5. Lat. 1° 45′ S.; long. 32° 15′ W. Moderate trades: S. E. to E., E. S. E., S. E.

July 6. Lat. 2° 28′ S.; long. 31° 36′ W. Moderate winds: S. E., S. S. E., S. E.

July 7. Lat. 3° 47′ S.; long. 32° 22′ W. Fresh breezes, with squalls and rain; made the Island of Fernando de Noronha. Winds: S. E., S. S. E., E. S. E.

July 8. Lat. 6° 45′ S.; long. 32° 32′ W. Strong breezes: E. S. E., S. E. by E.

Ship Sabine (H. Libbey), Boston to Calcutta, 20 days out.

June 25, 1852. Lat. 21° 54′ N.; long. 35° 00′ W. Moderate breezes and cloudy weather. E. ½ S. throughout.

June 26. Lat. 18° 26′ N.; long. 34° 20′ W. Strong trades with squalls, east.

June 27. Lat. 15° 13′ N.; long. 33° 24′ W. Strong trades with squalls, east.

June 28. Lat. 12° 13′ N.; long. 32° 04′ W. Strong trades with squalls, E. N. E.

June 29. Lat. 10° 06′ N.; long. 30° 57′ W. Heavy squalls from eastward, between them moderate breezes, cloudy. E. N. E., E. by N.

June 30. Lat. 8° 52′ N.; long. 30° 25′ W. First part pleasant; very light breeze; middle part, very light, with squalls from S. E. Latter part, squalls from northward to eastward, and S. S. E.

July 1. Lat. 7° 54′ N.; long. 29° 48′ W. First part, moderate breeze, N. E. by E. with heavy rain. Middle part, squally from S. E. Latter part, moderate from southward, with squalls.

July 2. Lat. 6° 43′ N.; long. 28° 30′ W. First and middle parts, light breezes, with frequent rain squalls, W. S. W.; latter part, cloudy, S. W. by S.

July 3. Lat. 6° 11′ N.; long. 28° 45′ W. Squally, with rain. South throughout.

July 4. Lat. 5° 09′ N.; long. 39° 15′ W. Moderate breeze and pleasant. South, S. E. by S., S. by E.

July 5. Lat. 4° 28′ N.; long. 29° 00′ W. Moderate breeze and pleasant; S. S. E., and S. by E.

July 6. Lat. 2° 14′ N.; long. 30° 15′ W. Strong breezes; S. E. by S., S. E. ½ S.

July 7. Lat. 0° 01′ S.; long. 31° 15′ W. Fresh trades, S. E., E. S. E., E. by S.

July 8. Lat. 2° 30′ S.; long. 31° 06′ W. Fresh breezes and pleasant, E. by S.

July 9. Lat. 5° 06′ S.; long. 32° 05′ W. Fresh breezes and pleasant, E. S. E.

Ship Probus (David Branscum), New York to Panama, thirty-eight days out.

July 2, 1853. Lat. 19° 44′ N.; long. 30° 05′ W. Winds: E. N. E., E. N. E., and east. Fresh breezes and cloudy weather.

July 3. Lat. 17° 22′ N.; long. 29° 25′ W. Winds: east, E. N. E., and east. Fine breezes and clear weather.

July 4. Lat. 15° 12′ N.; long. 29° 03′ W. Winds: east, east, E. N. E. Pleasant breezes and clear weather.

July 5. Lat. 12° 52′ N.; long. 28° 45′ W. Winds: E. N. E., N. E., and N. E. Pleasant breezes and cloudy weather.

July 6. Lat. 11° 54′ N.; long. 28° 29′ W. Winds: N. N. E., E. N. E., and east. Moderate breeze.

July 7. Lat. 10° 30′ N.; long. 28° 11′ W. Wind: east. Moderate breezes and cloudy.

July 8. Lat. 9° 01′ N.; long. 27° 42′ W. Winds: E. N. E., N. E., and east. Light breezes and clear weather.

July 9. Lat. 8° 08′ N.; long. 28° 18′ W. Wind: S. S. E. Baffling winds and cloudy, with thunder, lightning, and rain.

July 10. No observation. Winds: S. S. E., S. by E., and south. Light breezes and cloudy weather; showers.

July 11. Lat. 7° 18′ N.; long. 27° 50′ W. Winds: variable. Weather squally.

July 12. No observation. Winds: S. W., S. W., S. W. Moderate breezes and thick weather.

July 13. Lat. 5° 17′ N.; long. 27° 22′ W. Winds: south, south, and S. by W. Pleasant breezes and cloudy weather, with rain.

July 14. Lat. 5° 06′ N.; long. 25° 48′ W. Wind: S. by W. throughout. Fresh breezes from the southward, and clear.

July 15. No observation. Wind: S. by W. throughout. Moderate breezes, with thick rainy weather.

July 16. Lat. 3° 58′ N.; long. 26° 44′ W. Winds: S. W., south, and south. Moderate breezes and rainy weather.

July 17. Lat. 2° 43′ N.; long. 28° 37′ W. Winds: south, S. by W., and S. by E. Pleasant breeze and clear.

July 18. Lat. 0° 32′ N.; long. 30° 00′ W. Winds: S. S. E., S. E. by S., and S. E. Fresh breezes and clear weather.

July 19. Lat. 1° 35′ S.; long. 31° 08′ W. Wind: S. E. Moderate breezes and pleasant.

July 20. Lat. 3° 43′ S.; long. 31° 10′ W. Winds: S. E. by E., and E. S. E. Moderate breezes and squally; cloudy weather.

July 21. Lat. 5° 47′ S.; long. 32° 21′ W. Winds: S. E. by E., S. E., and S. E. by S. Pleasant breezes and cloudy, with light rain squalls.

Barque Reindeer (Wm. Weard), Baltimore to San Francisco, seventeen days out.

July 7, 1853. Lat. 20° 57′ N.; long. 45° 03′ W. Winds: E., E. by N., E. by N. Moderate breezes and squally weather.

July 8. Lat. 19° 06′ N.; long. 43° 41′ W. Winds: E. by N., throughout; fresh breezes and showers of rain.

July 9. Lat. 16° 52′ N.; long. 42° 04′ W. Winds: E. by N., E. N. E., and E. by N. Strong breezes with cloudy weather.

July 10. Lat. 14° 41′ N.; long. 40° 27′ W. Winds: E. by N. throughout, strong breezes and cloudy with rain.

July 11. Lat. 12° 45′ N.; long. 38° 38′ W. Winds: E. by N., E. N. E., E. N. E. Strong trades with fresh squalls.

July 12. Lat. 10° 56′ N. long. 36° 36′ W. Winds: E. N. E., N. E. by E., and E. N. E. Brisk breezes and hazy weather.

July 13. Lat. 9° 30′ N.; long. 34° 24′ W. Winds: E. N. E., N. E. by E., E. by N. Brisk breezes with squally hazy weather.

July 14. Lat. 8° 58′ N.; long. 33° 03′ W. Winds: variable from the southward. Variable breezes and squally weather.

July 15. Lat. 7° 19′ N.; long. 31° 05′ W. Winds: S. S. W. throughout, fresh breezes and heavy squalls.

July 16. Lat. 5° 44′ N.; long. 28° 29′ W. Winds: S. W., S. S. W., and S. by W. Brisk breezes and passing squalls.

July 17. Lat. 5° 24′ N.; long. 26° 10′ W. Winds: S. by W., S., and S. Moderate breezes and squally.

July 18. Lat. 4° 00′ N.; long. 27° 34′ W. Winds: S., S. by E., and S. S. E. Moderate breezes and passing squalls.

July 19. Lat. 1° 35′ N.; long. 28° 52′ W. Winds: S. S. E., S. E., and S. E. by S. Moderate breezes with passing squalls of rain and wind.

July 20. Lat. 1° 34′ S.; long. 30° 22′ W. Winds: S. E. by S., S. E., and S. E. Brisk breezes and fine weather.

July 21. Lat. 4° 30′ S.; long. 31° 26′ W. Winds: S. E., S. E. by E., and S. E. by E. Brisk breezes, with squalls of wind and rain.

July 22. Lat. 7° 12′ S.; long. 32° 17′ W. Winds: S. E. by E., S. E., and S. E. by S. Strong breezes, with heavy squalls of wind and rain.

Ship Robert Burton (John W. Dicks), New York to Columbia River, thirty days out.

July 19, 1852. Lat. 21° 20′ N.; long. 37° 48′ W. Winds: E. S. E., by S., E. by S. Fresh winds and squally.

July 20. Lat. 18° 49′ N.; long. 36° 53′ W. Winds: E. by S. Squally throughout.

July 21. No observations. Winds: E. by S. Squally.

July 22. Lat. 14° 08′ N.; long. 35° 14′ W. Winds: E. by S., E. by S., E. N. E. First part, squally; latter part, pleasant.

July 23. Lat. 12° 25′ N.; long. 33° 00′ W. Winds: E. N. E., E. N. E., N. W. First part, moderate with rain; latter, light wind from N. W.

July 24. Lat. 11° 28′ N.; long. 31° 43′ W. Winds: N. W., N. W., S. W. Showery all day.

July 25. Lat. 10° 47′ N.; long. 30° 31′ W. Wind: S. W. Rainy and squally all through this day.

July 26. Lat. 10° 06′ N.; long. 30° 20′ W. Winds: S. W., S. W., N. Rainy, squally, and variable weather through this day.

July 27. Lat. 8° 48′ S.; long. 29° 25′ W. Current, 1.7 knots per hour. Winds: first part, north; middle and latter, all around the compass. Rainy, squally, and variable weather.

July 28. Lat. 8° 02′ N.; long. 28° 50′ W. Winds: N., S. S. W., S. W. First part, light airs; wind hauled to S. S. W. in a heavy squall.

July 29. No observations. Winds: S. S. W., S. W. by S., S. W. by S. Rainy, cloudy, disagreeable weather.

July 30. Lat. 7° 41′ N.; long. 24° 55′ W. Wind: S. W. by S. Cloudy, rainy weather.

July 31. Lat. 6° 58′ N.; long. 23° 19′ W. Winds: S. W. by S., S. S. W., S. S. W. Clouds moving with great rapidity, N. E. by E.; the upper clouds moving slowly S. by W.

Aug. 1. Lat. 5° 59′ N.; long. 21° 50′ W. Wind: S. W. Feel I am steering too far east, but have had the neuralgia for the past twenty days, so as to be hardly able to move, and the ship is so crank, we do not get along very well by the wind.

Aug. 2. Lat. 4° 31′ N.; long. 20° 05′ W. Wind: S. S. W. Shall tack if no change occurs.

Aug. 3. Lat. 4° 58′ N.; long. 20° 28′ W. Wind: S. S. W. Tacked—lay up W. half S. Saw many Carey Chickens. Beautiful weather.

Aug. 4. Lat. 4° 01′ N.; long. 22° 26′ W. Winds: S. S. W., S. S. W., S. Fine weather, and the wind hauling more favorable.

Aug. 5. Lat. 2° 13′ N.; long. 24° 27′ W. Wind: S. S. E. Have now the S. E. trades, I hope.

Aug. 6. Lat. 0° 19′ S.; long. 26° 47′ W. Wind: S. S. E. Crossed the equator at 8 hours 15 min. A. M., in long. 26° 25′ W.

Aug. 7. Lat. 3° 02′ S.; long. 28° 33′ W. Winds: S. S. E., S. E., S. E. Very beautiful weather, and fine breeze.

Aug. 8. Lat. 5° 46′ S.; long. 30° 19′ W. Winds: S. E. by S., S. E. by S., S. E. Fine weather and winds.

Aug. 9. Lat. 7° 40′ S.; long. 32° 15′ W. Winds: S. E., S. E., S. S. E. Squally; heavy banks of cumulus in the south; the wind inclined that way.

Aug. 10. Lat. 7° 58′ S.; long. 33° 12′ W. Winds: S. S. E., S. S. W., S. E. by S. Squally.

Route to Rio, etc.—AUGUST.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			Direct.	Per cent.	True.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
From Sandy	Hook to										
39° 11′ N.	70° 00′	E. S. E.	199	12.3	223	3.0	13.2	11.4	72.4	5.4	366
37 33	65 00	E. S. E.	256	9.8	281	3.2	5.0	*w* 10.3	81.5	3.5	221
35 54	60 00	E. S. E.	259	8.0	280	2.2	5.4	*w* 9.7	82.7	4.1	185
35 00	57 20	E. S. E.	141	10.9	156	4.6	3.9	*w* 7.8	83.7	7.2	154
33 04	55 00	S. E.	165	8.5	178	1.9	*w* 11.4	3.8	82.9	3.6	53
31 19	50 00	E. S. E.	275	9.6	302	2.6	10.4	*w* 13.0	74.0	0.0	76
30 00	46 17	E. S. E.	207	15.2	238	4.6	9.2	*w* 25.3	60.9	6.5	43
29 32	45 00	E. S. E.	72	39.2	100	8.0	*w* 48.0	28.0	16.0	7.4	25
25 00	42 54	S. S. E.	294	6.4	312	1.5	*w* 19.1	0.0	79.4	2.9	68
22 21	40 09	S. E.	225	7.7	242	0.0	*w* 16.8	7.2	77.0	6.7	42
20 00	38 57	S. S. E.	153	4.8	160	2.0	*w* 8.0	0.0	90.0	0.0	49
15 00	36 47	S. S. E.	325	7.0	347	3.7	*w* 5.5	0.0	90.8	0.0	54
10 50	35 00	S. S. E.	271	8.5	294	2.8	*w* 8.6	4.7	83.9	7.1	105
10 00	34 38	S. S. E.	54	11.5	60	3.4	*w* 11.1	6.6	78.9	9.0	90
8 06	30 00	E. S. E.	297	8.0	320	0.0	8.8	*w* 15.8	75.4	8.1	57
5 00	26 53	S. E.	263	4.6	275	0.0	4.4	*w* 15.9	79.7	7.4	114
Equator	28 57	S. S. W.	325	10.1	358	1.3	*w* 35.1	0.0	63.6	1.2	78
			3781		4126						
1 00 S.	29 22	S. S. W.	65	1.4	66	0.2	4.5	0.3	95.0	0.0	402
2 32	30 00	S. S. W.	99	5.7	105	0.0	28.5	0.0	71.5	0.0	21
3 00	30 12	S. S. W.	30	13.3	34	0.0	66.6	0.0	33.4	0.0	9
5 00	31 00	S. S. W.	130	6.7	139	0.0	33.3	0.0	66.7	0.0	18
7 00	31 50	S. S. W.	130	0.0	130	0.0	0.0	0.0	0.0	0.0	18
Thence	*ad lib.*										

The only precaution to give with regard to this route—for in August the passage is liable to be tedious by any route—is not to cross the meridian of 50° W. to the north of 31°, or to the south of 29° N.

After reaching the meridian of 35° between the parallels of 11° and 10° N., stand straight as the winds will allow for the equator in about 29° or 30°, not caring if you fall upon the line as far as 33° W. After getting the S. E. trades in this month, there is no difficulty in making stretches to the E.; for the S. E. trades, frequently, at this season of the year, blow from S. S. E.; and if navigators will bear this fact in mind, they should not be discouraged if the wind should force them to cross the equator as far west as 35°; some have even crossed in 41°, and made good passages by taking advantage of slants south of the line to make easting with. But, of course, no navigator would willingly cross so far to the westward as longitude 40°. Actual trial has shown the best crossings to be in 34° for 10° N.; in 29° for 5° N.; and in 31° for the line: the average passage to this last crossing from the United States being 25½ days, and 3 days thence to the fair way off St. Roque.

Vessels from ports south of the Capes of Virginia, that intend to try this route, should run up to 34°, and continue between the parallels of 34° and 35°, until they fall in with the route as projected, which they will do somewhere between the meridians of 55° and 60°. This they are recommended to do on account of the calms of the horse latitudes, with which, by keeping south of 34°, in this season and part of the ocean, they are liable to be bothered.

In August, if between the meridians of 30° and 35°, expect to lose the N. E. trades from 14° to 10° N.; to have the equatorial calms from 13° to 9° N.; and the S. W. monsoons occasionally *only* from 12° to 5° N.

Between the meridians of 25° and 30° W., the N. E. trades are sometimes lost in 17° N., generally in 12°, though they are occasionally carried to 9°; seldom below. The calms prevail from 15° to 8° N., and the S. W. monsoons with considerable regularity from 14° N. to the equator. That is, you are liable to get them somewhere between 14° N. and the equator, as you are liable to encounter the calms and to lose the N. E. trades between the parallels above stated.

Ship Seaman (W. B. Daniels), New York to San Francisco, fifteen days out.

Aug. 18, 1852. Lat. 26° 03′ N.; long. 39° 29′ W. Winds: calm, S. E., S. First part, calm; middle part, light and baffling airs; thick banks of fog and very dark; latter part, fresh and pleasant.

Aug. 19. Lat. 22° 09′ N.; long. 38° 57′ W. Barometer, 30.20; temperature of air, 81°. Wind: E.; fresh trades, with passing squalls.

Aug. 20. Lat. 18° 24′ N.; long. 38° 02′ W. Current, N. W., ½ knot per hour. Barometer, 30.10. Wind: E. by N.; fresh trades, and squally.

Aug. 21. Lat. 15° 12′ N.; long. 36° 50′ W. Current, N. N. W., ¾ of a knot per hour. Wind: E. by N.; brisk trade-winds, and squally gloomy weather.

Aug. 22. Lat. 11° 52′ N.; long. 35° 25′ W. Temperature of air, 82°; of water, 81°. Wind: E. by N.; fresh trades, and squally.

Aug. 23. Lat. 11° 07′ N.; long. 35° 06′ W. Barometer, 30.00. Winds: E., calm, calm; first part, light winds; middle and latter part, calm. Observed tide rips.

Aug. 24. Lat. 9° 20′ N.; long. 34° 20′ W. Winds: calm, S. S. E., S. W. by S.; first part, calm; middle, moderate and rainy; latter, fresh and squally. A large swell from S. E.

Aug. 25. Lat. 7° 50′ N.; long. 31° W. Current, N., ¾ knot per hour. Barometer, 30.00; temperature of air, 82°; of water, 81°. Winds: S. S. W.; fresh breezes, with passing squalls.

Aug. 26. Lat. 6° 46′ N.; long. 28° 28′ W. Current, N., ¾ knot per hour; temperature of air, 81°. Wind: S. S. W.; first and middle parts, moderate; latter, fresh.

Aug. 27. Lat. 5° 46′ N.; long. 27° 28′ W. Current, N., ½ knot per hour. Wind: S. by W.; fresh breezes and squally.

Aug. 28. Lat. 4° 46′ N.; long. 28° 54′ W. Temperature of air, 82°. Wind: S. ½ W.; moderate breezes and pleasant weather.

Aug. 29. Lat. 3° 31′ N.; long 30° 26′ W. Temperature of air, 81°. Wind: S. by E.; light winds and pleasant.

Aug. 30. Lat. 1° 53′ N.; long. 30° 52′ W. Winds: S. by E., S. S. E., S. E. by S.; moderate breezes and pleasant.

Aug. 31. Lat. 0° 15′ N.; long. 31° 45′ W. Current, W. N. W., ½ knot per hour. Barometer, 30.10; temperature of air, 80°; of water, 80°. Wind: S. E. by S.; moderate breezes and pleasant.

Sept. 1. Lat. 2° 08′ S.; long. 32° 30′ W. Barometer, 30.00; temperature of water, 79°. Winds: S. E. by S., S. E. by S., S. E.; moderate breezes and pleasant.

Sept. 2. Lat. 3° 45′ S.; long. 32° 15′ W. Temperature of water, 78°. Wind: S. E.; first and middle parts, light and pleasant; ends with strong breezes. At noon, saw Fernando de Noronha, bearing W. S. W. ten miles distant.

Sept. 3. Lat. 7° S.; long. 33° 06′ W. Barometer, 30.10. Wind: S. E. by E.; fresh trade-winds and pleasant weather.

Ship Eagle (John S. Farron), New York to San Francisco, fifteen days out.

July 25. Lat. 19° 5′ N.; long. 46° 30′ W. Winds: E. by S., E. S. E., E. S. E. Fair weather.

July 26. Lat. 15° 20′ N.; long. 44° 55′ W. Wind: E. by S., east, and east. Fresh breezes and squally, with rain.

July 27. Lat. 12° 48′ N.; long. 44° 30′ W. Winds: E. by S., E. by E., E. S. E. Pleasant weather.

July 28. Lat. 10° 58′ N.; long. 44° 10′ W. Winds: E. S. E., E. S. E., and east. Pleasant weather.

July 29. Lat. 8° 57′ N.; long. 43° 47′ W. Wind: E. by S. Occasional squalls with rain.

July 30. Lat. 7° 49′ N.; long. 43° 39′ W. Winds: E. by S., E., and S. S. E. Calms, squalls, and rain.

July 31. Lat. 7° 12′ N.; long. 42° 10′ W. Wind from S. to N. W. Baffling, with squalls.

Aug. 1. Lat. 7° 44′ N.; long. 39° 16′ W. Winds: S. W., W., and S. W. Squally, with hard rain.

Aug. 2. Lat. 7° 56′ N.; long. 36° 41′ W. Winds: S., S. S. E., and S. E. by S. Squally, rainy weather.

Aug. 3. Lat. 7° 42′ N.; long. 35° 53′ W. Wind: S. by E., and calm; constant rain.

Aug. 4. Lat. 7° 50′ N.; long. 35° 01′ W. Variable winds, and squally, with rain.

Aug. 5. Lat. 7° 40′ N.; long. 35° 21′ W. Winds: S. S. W., S. W., and S. W., squally, with rain.

Aug. 6. Lat. 7° 29′ N.; long. 33° 47′ W. Winds: S. S. W., S. S. W., and S. E. Moderate breezes and squally.

Aug. 7. Lat. 7° 3′ N.; long. 33° 16′ W. Winds: calm, S. W. by S., S. W. by S. Squally, with rain.

Aug. 8. Lat. 6° 56′ N.; long. 29° 52′ W. Winds: S. S. W., calm, and S. by E. Squally, with rain.

Aug. 9. Lat. 6° 34′ N.; long. 26° 48′ W. Winds: S., S. S. W., and S. S. W. Squally, with rain.

Aug. 10. Lat. 5° 45′ N.; long. 22° 53′ W. Winds: S. by W., S. S. W., and S. by W. Squally with rain.

[The Eagle had bad luck certainly, inasmuch as she found the N. E. trades with southing in them. She met the doldrums just south of the parallel of 9° N. and near the meridian of 44° W. Here, Captain Farron availed himself of the monsoons to go east; and at the end of 9 days finds himself to *leeward* on the *other side* of his route. On August 8, being in 29° 50′, he finds the monsoon S. by E., right in his teeth. He stands on, and the next day is so far to the east that his course now is S. S. W.; at that point, he gets the wind; and thus he is forced to go as far as 22° W. before he can cross the parallel of 5° N. I do not think that the facts exhibited on the Charts would justify any one in pronouncing an opinion against the propriety of the course pursued to get to the eastward. Compare the Eagle's track with that of the Candace (p. 422). The C. crossed the parallel of 20° N. nearly 500 miles east of where the Eagle crossed it; yet, notwithstanding the Eagle's misfortunes, she beat the Candace a week to Cape St. Roque.]

Aug. 11. Lat. 4° 7′ N.; long. 24° 41′ W. Winds: S., S. by E., and S. S. E. Pleasant.

Aug. 12. Lat. 2° N.; long. 26° 36′ W. Winds: S., S. by E., and S. S. E. Fair weather.

Aug. 13. Lat. 24′ S.; long. 28° 29′ W. Winds: S. by E., S. S. E., and S. by E. Fair weather.

Aug. 14. Lat. 2° 24′ S.; long. 30° 4′ W. Winds: S. S. E. and S. by E. Fair weather.

Aug. 15. Lat. 4° 59′ S.; long. 32° 30′ W. Winds: S. S. E. and S. by E. Fair weather.

Aug. 16. Lat. 6° 1′ S.; long. 34° 16′ W. Winds: S. S. E., S. by E., and S. Strong gales and heavy squalls, rain.

Barque Panchita (Peterson), New York to Buenos Ayres, twenty days out.

Aug. 5, 1850. Lat. 21° 12′ N.; long. 40° 46′ W. Fresh and cloudy. Wind: E. N. E.

Aug. 6. Lat. 19° 25′ N.; long. 39° 48′ W. Fresh and cloudy. Winds: E., E. by N.

Aug. 7. Lat. 17° 41′ N.; long. 38° 37′ W. Variable, with squalls. Wind: E.

Aug. 8. Lat. 15° 32′ N.; long. 37° 10′ W. Fresh and cloudy. Wind: eastward.

Aug. 9. Lat. 13° 21′ N.; long. 35° 43′ W. Moderate and clear. Wind: E.

Aug. 10. Lat. 10° 42′ N.; long. 34° 28′ W. Moderate breezes; variable, rain squalls. Wind: N. E.

Aug. 11. Lat. 9° 56′ N.; long. 33° 18′ W. Moderate and cloudy. Winds: E. S. E., S., S. W. by S.

Aug. 12. Lat. 8° 34′ N.; long. (no obs.). Strong breezes and heavy rain squalls. Wind: S. W. by S.

Aug. 13. Lat. 8° 2′ N.; long. 29° 45′ W. Moderate breezes and hazy. Winds: S. W., S.

Aug. 14. Lat. 7° 48′ N.; long. 28° 27′ W. Light airs and foggy. Wind: S. by W.

Aug. 15. Lat. 7° 42′ N.; long. 28° 00′ W. Light breeze, S. by W.

Aug. 16. Lat. 7° 28′ N; long. 28° 30′ W. Strong breeze, S. E., S., S. W.

Aug. 17. Lat. 6° 43′ N.; long. 26° 42′ W. Fresh breeze and cloudy, W. S. W., S. W., S. by W.

Aug. 18. Lat. 6° 10′ N.; long. 25° 04′ W. Moderate and clear, S. S. W.

Aug. 19. Lat. 5° 00′ N.; long. 23° 20′ W. Light breeze and hazy, S. S. W., S. W.

Aug. 20. Lat. 4° 21′ N.; long. 24° 12′ W. Moderate and pleasant, S. W. by S.

Aug. 21. Lat. 3° 31′ N.; long. 25° 55′ W. Moderate and pleasant, S. W. by S.

Aug. 22. Lat. 2° 03′ N.; long. (———?) W. Moderate and pleasant, S. S. E.

Aug. 23. Lat. 0° 15′ N.; long. 28° 47′ W. Fresh breeze, S. S. E.

Aug. 24. Lat. 1° 23′ S.; long. 29° 30′ W. Strong breezes and cloudy, S. S. E.

Aug. 25. Lat. 3° 35′ S.; long. 30° 34′ W. Moderate, S. E.

Aug. 26. Lat. 6° 23′ S.; long. 31° 35′. Moderate, S. E.

Barque Candace (Joseph Arquit), New York to Shanghai, 23 days out.

Aug. 9, 1849. Lat. 19° 30′ N.; long. 39° 23′ W. Winds: E., E. by S., E. by S. Fresh breeze and pleasant; a heavy sea.

Aug. 10. Lat. 16° 57′ N.; long. 37° 48′ W. Wind: E. Brisk breeze and pleasant.

Aug. 11. Lat. 14° 20′ N.; long. 36° 17′ W. Winds: E., E., and E. S. E. Brisk winds, and clear weather.

Aug. 12. Lat. 12° 48′ N.; long. 35° 48′ W. Winds; E., E. N. E., and E. N. E. Moderate breezes and passing squalls.

Aug. 13. Lat. 11° 25′ N.; long. 35° 53′ W. Wind: E. N. E. Moderate breezes and clear.

Aug. 14. Lat. 10° 41′ N.; long. 32° 59′ W. Winds: E. N. E., E. S. E., and S. W. Baffling winds and weather.

Aug. 15. Lat. 9° 31′ N.; long. 31° 17′ W. Winds: S. W., S. W. by W., W. S. W. Baffling winds.

Aug. 16. Lat. 8° 00′ N.; long. 29° 45′ W. Winds: S. W. to N. W. Brisk baffling winds, and rain squalls.

Aug. 17. Lat. 7° 32′ N.; long. 27° 00′ W. Winds: S. S. W., S. S. W., and S. W. Strong winds; much rain.

Aug. 18. Lat. 6° 42′ N.; long. 24° 50′ W. Wind: S. S. W. Strong winds and pleasant weather.

Aug. 19. Lat. 6° 40′ N.; long. 23° 02′ W. Wind: S. S. W., S., and S. S. W. Light winds and clear pleasant weather.

Aug. 20. Lat. 6° 16′ N.; long. 23° 08′ W. Winds: S. S. W., and S. S. W.; light winds, and clear.

Aug. 21. Lat. 5° 52′ N.; long. 23° 29′ W. Winds: S. S. W., S., and S. S. W.; variable winds and weather.

Aug. 22. Lat. 5° 26′ N.; long. 21° 44′ W. Wind: S. S. W.; strong wind, passing squalls.

Aug. 23. Lat. 4° 50′ N.; long. 22° 29′ W. Wind: S.; light winds and calms.

Aug. 24. Lat. 3° 51′ N.; long. 21° 50′ W. Winds: S. S. W., S. W., S. W.; moderate breezes and squally.

Aug. 25. Lat. 2° 56′ N.; long. 20° 23′ W. Wind: S. W.; brisk winds, and cloudy.

Aug. 26. Lat. 1° 38′ N.; long. 22° 27′ W. Winds: S., S., and S. S. E.; light winds.

Aug. 27. Lat. 0° 16′ S.; long. 24° 08′ W. Winds: S. S. E., S. E. by S., and S. E. by S.; moderate trades and pleasant.

Aug. 28. Lat. 2° 24′ S.; long. 25° 23′ W. Wind: S. S. E.; light winds and pleasant.

Aug. 29. Lat. 5° 05′ S.; long. 27° 01′ W. Winds: S. S. E., S. E. by S., and S. E. by S.; moderate trades and pleasant.

Ship Louis Philippe (R. Benthal), Baltimore to Valparaiso, twenty-two days out.

Aug. 10, 1849. Lat. 18° 22′ N.; long. 35° 15′ W. Winds: E. by N., E. by S., and S. E.; cloudy and hazy.

Aug. 11. Lat. 15° 55′ N.; long. 36° 48′ W. Wind: E.; damp, cloudy weather.

Aug. 12. Lat. 13° 05′ N.; long. 35° 10′ W. Winds: E., and E. by N.; cloudy and damp.

Aug. 13. Lat. 11° 17′ N.; long. 34° 10′ W. Winds: E. by N., and E. N. E.; cloudy.

Aug. 14. Lat. 10° 51′ N.; long. 33° 24′ W. Wind: variable; cloudy, with light showers.

Aug. 15. Lat. 10° 07′ N.; long. 32° 33′ W. Winds: S. W. and W. N. W.; cloudy, with light rain.

Aug. 16. Lat. 1° 13′ N.; long. 31° 26′ W. Wind: N. W.; cloudy and rainy.

Aug. 17. Lat. 7° 55′ N.; long. 30° 01′ W. Wind: S. W.; rainy weather.

Aug. 18. Lat. 7° 52′ N.; long. 26° 46′ W. Wind: S. S. W.; squally and rainy.

Aug. 19. Lat. 7° 19′ N.; long. 24° 52′ W. Wind: southerly; clear and pleasant.

Aug. 20. Lat. 7° 05′ N.; long. 24° 30′ W. Wind: southerly; cloudy; a large sea.

Aug. 21. Lat. 6° 09′ N.; long. 23° 33′ W. Winds: S. W., W. S. W., and S. S. W.; cloudy with squalls.

Aug. 22. Lat. 5° 45′ N.; long 21° 30′ W. Winds: S. S. W., S. S. W., and S.; weather pleasant.

Aug. 23. Lat. 5° 23′ N.; long. 20° 55′ W. Wind: S. S. W.; clear weather.

Aug. 24. Lat. 3° 57′ N.; long. 19° 23′ W. Winds: S. W., S. W., and S. S. W.; cloudy, with light rain.

Aug. 25. Lat. 3° 04′ N.; long. 18° 24′ W. Winds: S. W., S. W., and S. S. W.; cloudy weather.

Aug. 26. Lat. 1° 51′ N.; long. 20° 46′ W. Winds: S. S. W., S. by W., and S. by E.; pleasant.

Aug 27. Lat. 0′ 14′ N.; long. 22° 59′ W. Winds: S., S. by E., and S. E. by S.; pleasant.

Aug. 28. Lat. 1° 26′ S.; long. 24° 27′ W. Wind: S. E. by S.; pleasant weather.

Aug. 29. Lat. 3° 41′ S.; long. 26° 27′ W. Wind: S. E. by S.; clear weather.

Aug. 30. Lat. 6° 22′ S.; long. 28° 28′ W. Wind: S. E.; weather pleasant.

Ship Sea Witch (G. W. Fraser), New York to San Francisco, sixteen days out.

Aug. 17, 1851. Lat. 21° 37′ N.; long. 42° 39′ W. Winds: E. by S., E. by S., and E. S. E.; fresh single reef gale, heavy sea.

Aug. 18. Lat. 18° 42′ N.; long. 40° 26′ W. Wind: E. by N.; fresh breeze and pleasant.

Aug. 19. Lat. 15° 49′ N.; long. 39° 14′ W. Winds: E. by S., E. S. E., and E. by S.; fresh breezes with cloudy weather.

Aug. 20. Lat. 13° 06′ N.; long. 36° 44′ W. Winds: E., E. by S., and E. N. E.; fresh breezes and squally.

Aug. 21. Lat. 11° 25′ N.; long. 35° 31′ W. Winds: E. N. E., calm, southerly; moderate and light breezes and pleasant.

Aug. 22. Lat. 10° 38′ N.; long. 34° 11′ W. Winds: southerly, S. S. W., and S. S. W.; variable breezes and squally.

Aug. 23. Lat. 10° 09′ N.; long. 34° 17′ W. Winds: calm, calm, and N. E.; calms and light airs.

Aug. 24. Lat. 8° 24′ N.; long. 33° 10′ W. Winds: N. N. E., N. E., and N.; light breezes and squally.

Aug. 25. Lat. 7° 08′ N.; long. 31° 35′ W. Winds: N. W., S. W., and S. W. by S.; light breezes and squally.

Aug. 26. Lat. 5° 58′ N.; long. 29° 26′ W. Winds: S. W., S. S. W., and S. W. by S.; light airs and squally.

Aug. 27. Lat. 5° 09′ N.; long. 29° 26′ W. Winds: S. S. W., S., S.; moderate breezes and cloudy.

Aug. 28. Lat. 3° 50′ N.; long. 24° 44′ W. Wind: S. S. W.; moderate breezes and pleasant.

[This is another case of falling to leeward on the other side. When the navigator gets as far east in the doldrums as he wants to go, he finds the monsoons so changed that they are directly in his teeth. As an illustration, see the track of the Panchita (p. 421), Aug. 19. I should advise navigators on such occasions, when they have got as far to the east as 30° west, to beat down on that parallel; for there is reason to believe that, by remaining stationary, these doldrums will leave you quite as soon as you can get clear of them by running along with them to the east.]

Aug. 29. Lat. 2° 13′ N.; long. 25° 19′ W. Winds: S. S. W., S. by W., and S.; moderate breezes and pleasant; at 9, tacked ship.

Aug. 30. Lat. 0° 20′ S.; long. 27° 11′ W. Wind: S. S. E., moderate trades and pleasant.

Aug. 31. Lat. 3° 40′ S.; long. 26° 11′ W. Wind: S. S. E.; weather pleasant.

Sept. 1. Lat. 6° 46′ S.; long. 32° 08′ W. Winds: S. S. E., S. E. by S., and S. by E.; moderate breezes with passing showers of rain.

Route to Rio, etc.—SEPTEMBER.

Latitude.	Longitude.	Course.	DISTANCES.			WINDS; PER CENT.					Total No. observations.
			Direct.	Per cent.	Average.	Head.	SLANTS FROM N'd or E'd.	SLANTS FROM S'd or W'd.	Fair.	Calms.	
40° 27′ N.	70° 00′	E.	186	13.0	210	2.5	*w* 17.0	*w* 14.0	66.5	3.4	200
38 52	65 00	E. S. E.	249	9.9	274	2.2	*w* 12.4	7.5	77.9	5.1	184
37 14	60 00	E. S. E.	256	7.4	275	0.7	*w* 12.6	7.7	79.0	3.3	447
35 35	55 00	E. S. E.	260	7.4	279	1.6	8.8	7.2	82.4	4.0	123
35 00	54 18	S. E.	48	25.3	60	9.4	13.7	*w* 16.6	60.3	3.5	139
33 31	50 00	E. S. E.	232	15.0	267	3.0	3.0	*w* 42.0	52.0	0.0	34
31 47	45 00	E. S. E.	272	15.4	313	6.0	4.0	*w* 22.0	68.0	5.7	50
30 00	42 55	S. E.	151	15.0	174	2.9	11.5	*w* 21.7	63.9	4.2	69
27 27	40 00	S. E.	217	17.9	255	2.8	11.2	*w* 25.2	60.8	2.7	36
25 00	37 16	S. E.	208	16.8	243	3.4	17.9	16.8	61.9	1.1	89
20 00	37 16	S.	300	4.2	313	4.2	*w* 10.5	0.0	85.3	2.6	38
15 00	35 06	S. S. E.	325	0.0	325	0.0	0.0	0.0	100.0	0.0	23
10 00	32 58	S. S. E.	325	7.8	349	1.6	*w* 11.3	9.8	77.1	6.1	61
8 47	30 00	E. S. E.	191	16.8	223	2.8	3.6	*w* 30.8	60.8	4.0	73
5 00	27 11	S. E.	321	18.4	380	5.8	9.6	*w* 23.0	61.6	7.1	104
Equator*	29 15	S. S. W.	325	14.1	370	6.2	*w* 34.3	1.4	58.1	0.0	70
			3866		4310						
1 58 S.	30 00	S. S. W.	118	17.4	138	4.4	*w* 13.3	5.7	58.6	0.0	297
3 00	31 02	S. W.	88	9.6	96	0.0	*w* 48.2	0.0	51.8	0.0	27
5 00	31 52	S. S. W.	130	12.5	145	0.0	*w* 62.5	0.0	37.5	0.0	24
5 19	32 00	S. S. W.	21	3.4	22	0.0	*w* 16.7	0.0	83.3	0.0	12
7 00	32 42	S. S. W.	108	7.2	115	0.0	*w* 35.7	0.0	64.3	0.0	14
7 43	33 00	S. S. W.	47	1.3	48	0.0	*w* 6.0	0.0	94.0	0.0	17
9 00	33 32	S. S. W.	83	8.0	91	0.0	*w* 36.6	0.0	63.4	0.0	30

It may be said that the N. E. trade-winds prevail in September and October along this route only to the east of longitude 50°, and then only between the parallels of 15° and 25° N. They sometimes blow in other parts of the ocean, but it cannot be said that they *prevail.*

Endeavor to cross the meridian of 50°, in September and October, before you do the parallel of 30° N., and do not consider yourself hopelessly to leeward, if you be *forced* to cross the parallel of 20° N., as far

* The best routes for October and November do not differ materially from those for September and December. See Pilot Charts.

west as longitude 45°, or the parallel of 10 N., as far as 36° or 37° W.; for in September and October, as the Pilot Charts show, you may frequently meet, between 10° N. and the equator, the S. E. trade-winds.

The S. E. trades may be calculated on with certainty between 7° N. and 13° N., between 35° and 40° W. Occasionally, the S. W. monsoons are found between the same parallels: they will enable you to make easting. The S. E. trades, when taken in the northern hemisphere in this month, are frequently at S. S. E.; and, therefore, it is not difficult for vessels that find themselves as far west as longitude 37°, in latitude 10° N., to get to the eastward of 34° before crossing the line. The best crossings are shown by trial to be long. 33° for 10° N.; long. 28° for 5° N., and 31° for the equator. This is the worst month in the year, the average to the line running as high as 37 days. From May to October inclusive is the worst time for quick passages. The average for these six months is six days greater than it is for the other six. December gives an average of nine days less, or twelve days less than September. It is the best month for small averages.

Between long. 30° and 35°, the equatorial calms are found from 4° to 12° N., and between long. 25° and 30°, they, and the S. W. monsoons, are found from 12° to the equator; and as a general rule they are found more and more vexatious as you go east.

Captain Sinclair, when in command of the U. S. frigate Congress, on her way to South America, with that close observation of all the phenomena about him which gives a particular value to his remarks, observed the difficulties of crossing this belt far to the eastward. He crossed it in January, 1818, and inferred that there was a belt of monsoons between the two trades. He was mistaken as to the time of the year. He crossed this belt in January; and though, in January, the winds are sometimes from the S. W., yet, at that time of the year, they have nothing of the character of monsoons about them.

I quote a passage from his Journal:—

"We made a great run from their latitude (the Cape de Verdes), to about 7° 30′, when the N. E. trade began gradually to leave us, which it did effectually before we reached the latitude of 6° 30′ N., having run from 19° 30′, a distance of near nine hundred miles, between the 31st December and the 5th January; and from this time to the 17th there was little else than a continual calm, except when occasionally disturbed by a thunder-squall and violent rains. Though, considering we were at one time as far east as long. 19° W., we had very little rain and very few squalls of wind; those we had were principally from S. S. W. to W. S. W.; indeed, there appears to be, between the N. E. and S. E. trade-winds, which we found to be from 6° 30′ N. to the equator, a light monsoon from the S. W."

Had this remark been made in the summer instead of the winter, it would have been perfectly correct.

If, after getting within these latitudes, *i. e.* those in which the calms are mentioned as prevailing, and the wind should come out at S. E., prefer the port tack; for, before you make the land, you are almost sure to have the wind out from the S. S. E., when you can make your easting within the regions of the perpetual S. E. trades.

After getting the S. E. trades, and finding himself a little pinched for easting to clear the land, the skilful navigator will see that, by standing on with the wind at S. E., all the chances are in his favor. If

the wind haul to S. S. E., he can go about and make easting. If it veer to E. S. E., or farther, he can lay up and clear the land; for whether you go this or that side of Fernando de Noronha, in this or any other month, is a matter of no sort of consequence, excepting only so far as the difference of longitude is concerned. If you can weather it, do so, but do not waste time simply that you may pass to the eastward of it.

Good passages are sometimes made in September, but, as a general rule, the most tedious seasons of the year are the summer and fall months, for passages.

After losing the N. E. trades, the navigator may consider himself fortunate, in this month, if he is not baffled about for more than a week before he gets the S. E. trades.

Schooner David C. Foster (N. H. Canput), New York to Para, twenty days out.

Aug. 30, 1850. Lat. 19° 33′ N.; long. 43° 40′ W. Winds: E. by S., E. by S., and E. Fresh breeze and clear weather.

Aug. 31. Lat. 16° 13′ N.; long. 43° 38′ W. Wind: east. Fresh breeze and clear.

Sept. 1. Lat. 13° 13′ N.; long. 43° 20′ W. Winds: E., N. N. E. Trade-winds, and heavy tide rips.

Sept. 2. Lat. 10° 27′ N.; long. 43° 6′ W. Winds: N. E., E. N. E., N. E. Fine weather.

Sept. 3. Lat. 8° 36′ N.; long. 43° 7′ W. Wind: variable, from N. E. to S. Baffling and squally.

Sept. 4. Lat. 8° 24′ N.; long. 42° W. Wind: southerly. Variable breezes, and heavy tide rips.

Sept. 5. Lat. 7° 52′ N.; long. 41° W. Light southerly winds, and squally.

Sept. 6. Lat. 6° 37′ N.; long. 40° W. Winds: southerly, light, and squally.

Sept. 7. Lat. 5° 15′ N.; long. 39° 30′ W. Winds: light, S. E. trades.

Sept. 8. Lat. 3° N.; long. 41° 22′ W. Winds: S., S. E., S. E. by E. Pleasant weather.

Sept. 9. Lat. 1° 19′ N.; long. 43° W. Winds: S. E., E., S. E. by E. Squally, and heavy rain.

Sept. 10. Lat. 00° 38′ S.; long. 46° 43′ W. Winds: S. E. by E. Fresh breeze, and clear weather.

Sept. 11. Lat. 00° 40′ S.; long. 45° 00′ W. Winds: S. E. by E. Fresh breeze, and clear weather.

Sept. 12. Arrived at Para, Brazil.

Steamer Chesapeake (C. H. Baldwin), New York to Rio Janeiro, twenty-one days out.

August 31, 1849. Lat. 19° 36′ N.; long. 39° 22′ W. Winds: W. N. W., S. S. W., and S. E. Moderate breeze, and rain squalls.

Sept. 1. Lat. 17° 44′ N.; long. 38° 28′ W. Winds: E., E. by N., and E. Moderate and strong breeze, and pleasant.

Sept. 2. Lat. 15° 46′ N.; long. 37° 30′ W. Winds: E. and E. by N. Squally, with fresh breeze.

Sept. 3. Lat. 13° 42′ N.; long. 36° 25′ W. Winds: E. by N., E. N. E., and E. Fresh breeze, and squally.

Sept. 4. Lat. 12° 46′ N.; long. 36° 48′ W. Winds: variable from the southward. Squally, with light rain.

Sept. 5. Lat. 11° 30′ N.; long. 34° 40′ W. Winds: N. W., W. N. W., and S. W. Squally, with rain.

Sept. 6. Lat. 9° 42′ N.; long. 32° 20′ W. Winds: N. W., W., and S. W. Squally, with rain.

Sept. 7. Lat. 8° 00′ N.; long. 30° 50′ W. Winds: S. W., S. S. W., and S. W. Light breeze and squally, with rain.

Sept. 8. Lat. 7° 04′ N.; long. 29° 34′ W. Winds: S. W., variable, S. W., rain squalls and calms.

Sept. 9. Lat. 6° 37′ N.; long. 27° 30′ W. Winds: S. S. W., S. by W., and S. Squally, with heavy rain.

Sept. 10. Lat. 5° 27′ N.; long. 26° 46′ W. Wind: S. Light breeze, and pleasant.

Sept. 11. Lat. 4° 10′ N.; long. 26° 36′ W. Wind: S. S. W. Moderate and pleasant.

Sept. 12. Lat. 3° 00′ N.; long. 26° 10′ W. Wind: S. by W. Light and pleasant.

Sept. 13. Lat. 1° 30′ N.; long. 26° 30′ W. Wind: S. Pleasant weather.

Sept. 14. Lat. 0° 26′ N.; long. 27° 00′ W. Winds: S. S. E., S. E. by S., and S. E. by S. Light breeze, and pleasant.

Sept. 15. Lat. 0° 11′ N.; long. 27° 37′ W. Winds: S. S. E., S. E. by E., S. E. by E. Moderate and pleasant.

Sept. 16. Lat. 1° 22′ S.; long. 28° 06′ W. Winds: S. by E., S., and S. S. E. Light airs.

Sept. 17. Lat. 2° 38′ S.; long. 29° 10′ W. Winds: S. E., S. E. by S., and S. S. E. Pleasant weather.

Sept. 18. Lat. 3° 46′ S.; long. 30° 34′ W. Winds: S. S. E., S., and S. S. E. Moderate breeze, and pleasant.

Sept. 19. Lat. 5° 34′ S.; long. 32° 16′ W. Wind: S. S. E. Fresh breeze, and pleasant.

Barque Antelope (R. D. White), Baltimore to San Francisco, twenty days out.

Sept. 4, 1853. Lat. 19° 53′ N.; long. 42° 15′ W. Winds: E., E. S. E., and E. S. E. Squally, with rain.

Sept. 5. Lat. 18° 00′ N.; long. 41° 54′ W. Winds: E., and E. S. E. Squally, with rain.

Sept. 6. Lat. 15° 23′ N.; long. 41° 38′ W. Winds: S. E. by E., S. E., and E. S. E. Occasional rain squalls.

Sept. 7. Lat. 13° 44′ N.; long. 39° 45′ W. Winds: E. N. E., N. E. by E., and N. E. by E. Light winds and occasional rain squalls.

Sept. 8. Lat. 12° 47′ N.; long. 37° 50′ W. Winds: N. E. by E., N. E., and E. N. E. Strong variable winds and rain.

Sept. 9. Lat. 11° 37′ N.; long. 36° 34′ W. Winds: calm, squally, and south. Much rain.

Sept. 10. Lat. 11° 35′ N.; long. 35° 28′ W. Winds: calm, S. E., and N. E. Squally, with rain.

Sept. 11. Lat. 9° 27′ N.; long. 34° 18′ W. Winds: N. E., E. N. E., and E. Occasional light squalls of rain.

Sept. 12. Lat. 8° 18′ N.; long. 33° 24′ W. Winds: E., E., W. N. W. Squally, with much rain.

Sept. 13. Lat. 6° 50′ N.; long. 30° 57′ W. Winds: W., W. S. W., and W. S. W. Squally, and much rain.

Sept. 14. Lat. 6° 28′ N.; long. 29° 02′ W. Winds: S., S. S. W., S. by W. Much rain, with variable winds.

Sept. 15. Lat. 6° 25′ N.; long. 26° 30′ W. Wind: S. Pleasant.

Sept. 16 Lat. 5° 53′ N.; long. 26° 49′ W. Winds: S., S., and S. S. E. Moderate breezes and pleasant.

Sept. 17. Lat. 5° 38′ N.; long. 26° 40′ W. Winds: S. by E., S., and S. Light breezes and pleasant.

Sept. 18. Lat. 5° 08′ N.; long. 26° 34′ W. Winds: S. by E., S. by W., and S. Light breezes.

Sept. 19. Lat. 4° 37′ N.; long. 27° 00′ W. Winds: S. by W., S., and S. Light breezes and pleasant.

Sept. 20. Lat. 4° 25′ N.; long. 25° 20′ W. Winds: S. by W., S. by E., and S. S. W. Fresh breezes. and flying clouds.

Sept. 21. Lat. 2° 31′ N.; long. 26° 47′ W. Winds: S. by E., S. S. E., and S. by E. Fresh breezes.

Sept. 22. Lat. 00° 02′ S.; long. 28° 26′ W. Wind: S. S. E. Strong breezes, and pleasant.

Sept. 23. Lat. 2° 54′ S.; long. 29° 11′ W. Winds: S. S. E., S. E., and E. by S. Good breezes and clear weather.

Sept. 24. Lat. 4° 26′ S.; long. 29° 32′ W. Wind: E. by S. Steady breezes.

Sept. 25. Lat. 6° 05′ S.; long. 30° 05′ W. Winds: E. by S., E. S. E., and E. Moderate breezes.

Ship Monsoon (L. Winsor), Boston to San Francisco, twenty days out.

Sept. 18, 1852. Lat. 19° 58′ N.; long. 41° 44′ W. Winds: E. S. E., E. S. E., and N. E. Light breezes and squally.

Sept. 19. Lat. 17° 20′ N.; long. 40° 19′ W. Winds: E., E. S. E., E. S. E. Fresh breezes and passing squalls.

Sept. 20. Lat. 14° 57′ N.; long. 38° 58′ W. Winds: E., E. S. E., and E. S. E. Fresh trades, and thick cloudy weather.

Sept. 21. Lat. 12° 18′ N.; long. 37° 08′ W. Wind: E. Fresh trades and cloudy.

Sept. 22. Lat. 11° 09′ N.; long. 30° 21′ W. Winds: E. S. E., S. S. W., and W. N. W. Fresh breezes and fresh squalls, with heavy tide rips; latter part, light breezes.

Sept. 23. Lat. 10° 12′ N.; long. 34° 24′ W. Winds: variable and calm. Frequent squalls and heavy tide rips.

Sept. 24. Lat. 9° 12′ N.; long. 34° 12′ W. Light variable breezes and frequent squalls.

Sept. 25. Lat. 9° 17′ N.; long. 33° 30′ W. Winds: E. N. E., variable, and calm. Light breezes and pleasant; much lightning during the night.

Sept. 26. Lat. 8° 21′ N.; long. 31° 55′ W. Winds: W. N. W., W. N. W., and W. Light breezes and pleasant weather.

Sept. 27. Lat. 6° 33′ N.; long. 29° 30′ W. Winds: W., W., and S. W. Fresh breezes and squally.

Sept. 28. Lat. 6° 39′ N.; long. 26° 39′ W. Winds: S. S. W., S. W., and S. Fresh gales, and heavy squalls with rain.

Sept. 29. No observation. Winds: S. W., S. S. W., and S. W. Calms and squalls.

Sept. 30. Lat. 5° 55′ N.; long. 25° 13′ W. Calm, with constant rain.

Oct. 1. Lat. 4° 25′ N.; long. 27° 10′ W. Wind: S. Squally and variable; pleasant weather.

Oct. 2. Lat. 2° 33′ N.; long. 29° 30′ W. Wind: S. Firm breezes and pleasant weather.

Oct. 3. Lat. 00° 01′ S.; long. 32° 25′ W. Wind: S. S. E. Light breezes and fine weather. Current, 28′ S. W.

Oct. 4. Lat. 2° 55′ S.; long. 34° 37′ W. Wind: S. S. E. Fine breezes and pleasant weather. Current, 30′ S. W.

Oct. 5. Lat. 4° 55′ S.; long. 35° 23′ W. Wind: S. E. Fine breezes and pleasant weather. Current, 12 miles, S. W.

Oct. 6. Lat. 5° 11′ S.; long. 34° 30′ W. Wind: S. E. Fine breezes and pleasant weather.

Ship Thomas W. Sears (Joseph Osgood), New York to California, thirty days out.

Sept. 18, 1852. Lat. 19° 41′ N.; long. 35° 42′ W. Current, 1.1 knot per hour, N. 53° W. Barometer, 30.00; temperature of air, 79°; of water, 80°. Winds: S. S. E., S. E. by E., E. First part, light airs; middle part, moderate breezes; latter, fine trades.

Sept. 19. Lat. 16° 53′ N.; long. 34° 54′ W. Current, west, 0.4 knot per hour. Barometer, 30.00; temperature of air, 81°; of water, 80°. Winds: E. by N., E., E. S. E. Strong trades and pleasant. A cross sea on.

Sep. 20. Lat. 14° 21′ N.; long. 33° 54′ W. Current, N. 63° W., 0.4 knot per hour. Barometer, 29.90; temperature of air, 80°; of water, 81°. Wind: E. Fine trades and pleasant weather.

Sept. 21. Lat. 12° 24′ N.; long. 32° 21′ W. Barometer, 29.83; temperature of air, 81°; of water, 80°. Winds: E., E. by N., E. Fine trades and hazy weather. Saw strong tide rips.

Sept. 22. Lat. 11° 49′ N.; long. 31° 38′ W. Barometer, 29.90; temperature of air, 83°; of water, 83°. Winds: E. by E., W., N. W. First part, moderate winds; middle and latter, light airs and calms. Saw several tide rips.

Sept. 23. Lat. 10° 35′ N.; long. 30° 36′ W. Current, N. W., 0.5 knot per hour. Barometer, 29.90; temperature of air, 83°; of water, 81°. Winds: N., N. E., N. First part, moderate breezes; middle and latter, baffling.

Sept. 24. Lat. 9° 29′ N.; long. 29° 51′ W. Current, W. N. W., 0.6 knot per hour. Barometer, 29.90; temperature of air, 83°; of water, 82. Winds: N. W., N., N. W. Very light winds throughout.

Sept. 25. Lat. 8° 20′ N.; long. 28° 34′ W. Barometer, 29.83; temperature of air, 83°; of water, 81°. Wind: N. W.; moderate breezes, and pleasant. A S. E. swell on.

Sept. 26. Lat. 6° 17′ N.; long. 26° 46′ W. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: N. W., W., S. W.; first part, strong breeze and squally. Latter part, fresh gale, with an ugly sea.

Sept. 27. Lat. 5° 54′ N.; long. 24° 54′ W. Barometer, 29.90; temperature of air, 81°; of water, 81°. Winds: S. S. W., S. by W., S. by W.; weather moderating, made sail, some head sea.

Sept. 28. Lat. 5° 32′ N.; long. 23° 11′ W. Barometer, 29.90; temperature of air, 80°; of water, 81°. Winds: S. S. W., S. by W. ½ W., S. by W.; light airs, and cloudy.

Sept. 29. Lat. 4° 47′ N.; long. 23° 40′ W. Barometer, 29.90; temperature of air, 79°; of water, 80°. Winds: S., S. by W., S.; moderate and cloudy.

Sept. 30. Lat. 3° 41′ N.; long. 25° 30′ W. Barometer, 29.84; temperature of air, 80°; of water, 80°. Winds: S., S., S. by E.; fine breezes and pleasant weather.

Oct. 1. Lat. 1° 52′ N.; long. 27° 14′ W. Current, W. N. W., 15 miles per 24 hours; variation 10° 30′ W. Barometer, 29.90; temperature of air, 79°; of water, 79°; Wind: S. S. E.; fine trades and pleasant.

Oct. 2. Lat. 0° 24′ N.; long. 28° 44′ W. Current, W. N. W., 0.5 knot per hour. Barometer, 20.95; temperature of air, 80°; of water, 79°. Winds: S. S. E., S. by E., S. S. E.; moderate and pleasant.

Oct. 3. Lat. 1° 35′ S.; long. 30° 33′ W. Current, N. 54° W., ¾ knot per hour. Barometer, 29.90; temperature of air, 79°; of water, 77°. Winds: S. S. E., S. S. E., S. E. by S.; fine trades and pleasant. The water looks green.

Oct. 4. Lat. 3° 35′ S.; long. 31° 27′ W. Current, N., 10 miles during the day. Barometer, 29.90; temperature of air, 79°; of water, 78°. Wind: S. E. by S.; pleasant trades.

Oct. 5. Lat 5° 28′ S.; long. 32° 29′ W. Current, W., thirteen miles during the day. Barometer, 29.98; temperature of air, 78°; of water, 79°. Wind: S. E. by S.; moderate trades and fine weather.

Oct. 6. Lat. 7° 34′ S.; long. 33° 40′ W. Current, S. 56° W., three-fourths of a knot per hour. Barometer, 29.94; temperature of air, 79°; of water, 79°. Wind: S. E. by S.; moderate trades and fine weather.

Ship John Wade (J. H. Little), New York to San Francisco, thirteen days out.

Sep. 26, 1853. Lat. 21° 28′ N.; long. 34° 58′ W. Barometer, 29.80; temperature of air, 81°; of water, 81°. Winds: S. S. E., S. E., and S. E. by E. Light baffling winds and fine weather.

Sept. 27. Lat. 17° 44′ N.; long. 35° 10′ W. Barometer, 29.90; temperature of air, 82°; of water 82°. Wind: E. Fresh breezes and clear.

Sept. 28. Lat. 15° 00′ N.; long. 34° 50′ W. Barometer, 21.40; temperature of air, 80°; of water, 80°. Winds: E., and E. S. E. First part, fresh breezes; middle part, strong gale. At 8 A. M. hove to under close-reefed main-topsail. At 8, barometer, 29.60.; at 10, 29.7; at 12 M., 29.3.

Sept. 29. Lat. 14° 32′ N.; long. 34° 31′ W. Barometer, 29.60; temperature of air, 80°; of water,

80°. Winds: W., S. S. W., S. S. W. Heavy gale, with violent squalls of wind and rain; middle part, sharp lightning; latter part, moderate. Made sail. I think I was near the track of a hurricane.

Sept. 30. Lat. 13° 39′ N.; long. 32° 53′ W. Current, E. by N., thirty miles. Barometer, 29.80; temperature of air, 79°; of water, 79°. Winds: S. S. W., S. S. W., W. S. W. First part, squally; latter part, a light breeze.

Oct. 1. Lat. 13° 16′ N.; long. 32° 00′ W. Current, E. N. E., thirty-five miles. Barometer, 29.80; temperature of air, 79°; of water, 79°. Winds: W., S. W., S. W., and calm.

Oct. 2. Lat. 12° 57′ N.; long. 32° 10′ W. Current, ten miles, S. W. Barometer, 29.90; temperature of air, 79°; of water, 79°. Wind: calm throughout. Ship without steerage way.

Oct. 3. Lat. 11° 51′ N.; long. 32° 18′ W. Current, N. ¼ W., forty miles. Barometer, 29.90; temperature of air, 80°; of water, 80°. Winds: N. N. E., N. E., E. by S. Surprised at finding so much current, there being no sign of any.

Oct. 4. Lat. 9° 20′ N.; long. 31° 40′ W. Barometer, 29.90; temperature of air, 80; of water, 80°. Winds: E. by S., E. S. E., and S. E. Squally and baffling; strong tide rips.

Oct. 5. Lat. 8° 58′ N.; long. 31° 18′ W. Current, for yesterday and to-day, sixty miles east. Barometer, 29.90; temperature of air, 81°; of water, 80°. Winds: S. E., calm, calm. Light breezes and showery.

Oct. 6. Lat. 8° 01′ N.; long. 30° 41′ W. Barometer, 29.90; temperature of air, 82°; of water, 81°. Winds: calm, E. S. E., and E. Baffling air; latter part, hard rain.

Oct. 7. Lat. 7° 23′ N.; long. 30° 10′ W. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: calm, S. S. W., N. E. Light baffling airs, calms, and rain.

Oct. 8. Lat. 6° 42′ N.; long. 29° 17′ W. Current, for two days, thirty miles E. by N. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: calm, S. W., and calm. Light baffling airs, and rain; S. W., and E. winds striving for the ascendency.

Oct. 9. Lat. 5° 32′ N.; long. 28° 30′ W. Current, E. ½ N., 25 miles. Barometer, 29.80; temperature of air, 82°; of water, 82°. Winds: calm, W. S. W., N. First part, calm; latter part, baffling airs, and showery.

Oct. 10. Lat. 3° 57′ N.; long. 26° 52′ W. Current, E., 24 miles. Barometer, 29.80; temperature of air, 83°; of water, 81°. Winds: S. W., S. S. W., S. by W. Light baffling airs and cloudy.

Oct. 11. Lat. 3° 10′ N.; long. 26° 24′ W. Current, W. by N., 20 miles. Barometer, 29.90; temperature of air, 82°; of water, 82°. Winds: S. by W., S. by W., S. Moderate breezes and cloudy. Tacked ship three times; have been as far east as 25° 50′ W., lat. 3° 22′ N.

Oct. 12. Lat. 1° 27′ N.; long. 28° 04′ W. Barometer, 29.90; temperature of air, 82°; of water, 81°. Winds: S. S. E., S. by E., S. by E.; light breezes, and cloudy, six days without any observation, and only two days pleasant since we left New York.

Oct. 13. Lat. 00° 33′ S.; long. 29° 40′ W. Barometer, 29.80; temperature of air, 81°; water, 81°.

Winds: S. S. E., S. by E., S. by E.; light breezes and showery, crossed the equator in 29° 12′ W. at 7 P. M. 32 days out.

Oct. 14. Lat. 3° 09′ S.; long. 31° 12′ W. Barometer, 29.80; temperature of air, 81°; of water, 80°. Winds: S. S. E., S. E. by S., S. S. E.; light breezes, and fine weather.

Oct. 15. Lat. 5° 37′ S.; long. 32° 30′ W. Barometer, 29.80; temperature of air, 81°; of water, 79°. Winds: S. S. E., S. E. by S., S. E.; light breezes and fine weather; saw several meteors last night.

Oct. 16. Lat. 8° 18′ S.; long. 32° 22′ W. Barometer, 29.90; temperature of air, 80°; of water, 79°. Winds: S. S. E., S. E., S. E.; moderate breezes and fine weather. I have not had any current for four days past.

From Capt. George Scott to Lieut. Maury.

San Francisco, *April* 29, 1853.

Inclosed is the abstract log of ship Adelaide Metcalf, under my command, on her last passage from New York, *via* Callao, to this place. I owe an apology for not forwarding it before now, as I have been in port since the 13th ult.

I understood, on my arrival here, that you had an agent to receive such communications, and endeavored to find him, but did not succeed; and, latterly, thought I would not send it until I had looked at the ship's bottom, to see if that had not something to do with my very long passage. I find upon heaving her out, that portions of the keel and shoe are gone, also, several planks cut nearly through, and the bottom quite ragged, caused by striking on the reef in East River, near Governor's Island, while coming out, and I am satisfied that this has been the cause of my long passage; although I think you will notice some peculiarities in the winds, as I found them in the northern tropic of the Atlantic and Pacific. I have all faith in your Charts and books, and value them highly, and endeavored to follow out your instructions. If I did not do so, hope I shall be convinced of my error at some future time. I shall continue to keep the abstract, on my future passages; and although poorly, still, I hope they will be of some slight service.

Ship Adelaide Metcalf (George Scott), New York to San Francisco, twenty-four days out.

Oct. 8, 1852. Lat. 15° 21′ N.; long. 40° 22′ W. Current, W. N. W., half knot per hour. Temperature of air, 83°; surface, 81°; of water, at ten feet six inches depth, 81°. Winds: E., E. by N., E. S. E. First and middle, moderate; latter, light at 11h. 30m. Squall from W. S. W. Noticed many and strong tide rips, with intervals of very smooth water. It seems rather problematical when, where, and how I am to make my easting, but so long as I can make a south, or S. W. course on this tack, I shall keep on. Barometer, 30.06.

Oct. 9. Lat. 13° 27′ N.; long. 40° 35′ W. Current, W. N. W., three-quarter knots per hour. Barometer, 30.06; temperature of air, 80½°; surface of water, 81°; water, at ten feet six inches depth, 81°. Winds: S. E., E. by S., E. S. E. First and middle, good breezes; latter part, light. Noticed tide rips and smooth places yesterday.

Oct. 10. Lat. 11° 57′ N.; long. 39° 34′ W. Current, W. N. W., one knot per hour. Barometer, 29.9; temperature of water, 81½°; of air, 82°; water, at ten feet six inches depth, 81°. Winds: E., E. N. E., E. N. E. From 2 to 12 P. M. two smart squalls from S., N. N. E., with rain; middle and latter part, good breezes, with squalls of rain; ends with a thick haze on the horizon at the N. E., and strong tide rips, as yesterday.

Oct. 11. Lat. 9° 51 N.; long. 37° 52′ W. Current, W. by N., half knot per hour. Barometer, 29.93; temperature of air, 82°; of water, 82°; water, at ten feet six inches depth, 82°. Winds: E. N. E., E. N. E., E. N. E. Good breezes and cloudy weather; squalls and showers; very powerful tide rips.

Oct. 12. Lat. 9° 05′ N.; long. 37° 22′ W. Current, S. E. by E., half knot per hour. Barometer, 29.98; temperature of air, 80°; of water, 83°; of water, at ten feet six inches depth, 83°. Winds: E., E., variable. Light baffling winds and squalls, with heavy showers of rain. Some tide rips; the wind has been around the compass several times.

Oct. 13. Lat. 8° 54′ N.; long. 36° 20′ W. Current, S. E. by E., half knot per hour. Barometer, 29.98; temperature of air, 80°; of water, 82°; of water, at 10 feet 6 inches depth, 82°. Winds: calm, E. N. E., calm. Middle part, lightning in the N. W.; at 10 P. M. had a violent squall from the N. E. attended with heavy rain.

Oct. 14. Lat. 7° 48′ N.; long. 35° 41′ W. Current, S. E. by E., one-quarter knot per hour. Barometer 30.00; temperature of air, 81°; of water, 82°; water, at 10 feet 6 inches depth, 82°. Winds: calm, S. S. W. S. S. W. First part, calm; midde and latter part, light airs.

Oct. 15. Lat. 7° 40′ N.; long. 35° 22′ W. Current, E. S. E., three-quarters knot per hour. Barometer, 30.04; temperature of air, 83°; of water, 83°; of water, at 10 feet 6 inches depth, 82½°. Winds: calm, calm, calm. First and middle parts, dead calm; latter part, light airs from south for four hours.

Oct. 16. Lat. 6° 50′ N.; long. 34° 43′ W. Current, one knot per hour. Barometer, 29.98; temperature of air, 81°; of water, 82½°; of water, at 10 feet 6 inches depth, 82½°. Winds: S. W., S. W., S. S. W. Light airs, and clear pleasant weather. I confidently expected the S. E. trades here, and, in fact, 6° north of this, but there seems to be nothing for us but head winds and calms.

Oct. 17. Lat. 5° 40′ N.; long. 33° 50′ W. Barometer, 29.97; temperature of air, 79°; of water, 82°. of water, at 10 feet 6 inches depth, 82°. Winds: S. S. W., S. W., S. W. Constant and heavy rain with calms; light winds and heavy squalls, and very bad sea.

Oct. 18. Lat. 6° 05′ N.; long. 32° 14′ W. Current, N. N. E., one knot per hour. Barometer, 30.00. temperature of air, 82°; of water, 82°; of water, at 10 feet 6 inches depth, 82°. Winds: S., S. by E., calm. Stood E. by S. 12 hours, when, finding we were losing the wind, tacked to the S. W.

Oct. 19. Lat. 5° 36′ N.; long. 32° 13′ W. Barometer, 30.00; temperature of air, 82½°; of water, 82°; of water, at 10 feet 6 inches depth, 82°. Winds: calm, calm, E. First and middle part, calm; latter, light wind and clear weather.

Oct. 20. Lat. 5° 15′ N.; long. 32° 53′ W. Current, W., three-quarters knot per hour. Barometer,

30.04; temperature of air, 82½°; of water, 83°; of water, at 10 feet 6 inches depth, 82½°. Winds: calm, calm, S. by E. Noticed many and strong tide rips.

Oct. 21. Lat. 4° 29′ N.; long. 33° 41′ W. Barometer, 30.03; temperature of air, 82½°; of water, 81°; of water, at 10 feet 6 inches depth, 82½. Winds: S. S. E., S. S. E., S. S. E. Moderate breezes. Stood S. W. 20 hours, and then tacked east; think we have got the trades.

Oct. 22. Lat. 4° 14′ N.; long. 33° 49′ W. Current, N. W., one knot per hour. Barometer, 30.03; temperature of air, 81½°; of water, 81½°; of water, at 10 feet 6 inches depth, 81°. Winds: S., S. S. E., calm. Light baffling winds and calms, and currents as per log. If I can get across the line anywhere, I shall do it as quick as possible, and take the chances at the southward of making easting, or beat by St. Roque near the land.

Oct. 23. Lat. 3° 58′ N.; long. 32° 35′ W. Barometer, 29.98; temperature of air, 80°; of water, 81°; of water, at 10 feet 6 inches depth, 81°. Winds: calm, S. by E., S. S. E. Middle and latter part, fresh breezes with thunder, lightning, and rain. Stood E. by S., and E. S. E, all day, excepting in two short but heavy squalls from east, when we stood south; no observations.

Oct. 24. Lat. 4° 36′ N.; long. 31° 32′ W. Barometer, 30.03; temperature of air, 81½°; of water, 81½°; of water, at 10 feet 6 inches depth, 81°. Winds: S., S., S. Stood E. S. E. all day, excepting in two or three short squalls. Find, by observations to-day, that we have had a very strong current the last two days.

Oct. 25. Lat. 3° 48′ N.; long. 31° 56′ W. Current, N. N. W., one knot per hour. Barometer, 30.05; temperature of air, 82½°; of water, 81°; of water, at 10 feet 6 inches depth, 81°. Winds: E. S. E., S. E., S. by E. Light winds and cloudy weather, with heavy swells from S. S. E.

Oct. 26. Lat. 2° 47′ N.; long. 32° 23′ W. Current, N. N. W., one and a quarter knots per hour. Barometer, 32.02; temperature of air, 82°; of water, 81°; of water, at 10 feet 6 inches depth, 81°. Winds: S. S. E., S. S. E., S. S. E. Light winds and clear weather.

Oct. 27. Lat. 2° 16′ N.; long. 33° 00′ W. Current, N. W., one knot per hour. Barometer, 30.02; temperature of air, 80°; of water, 80°; of water, at 10 feet 6 inches depth, 79½°. Winds: S. by E., S. S. E., S. Light winds and clear weather; water colder than it has been since entering the tropics; tacked three times.

Oct. 28. Lat. 1° 44′ N.; long. 33° 33′ W. Current, W. N. W., one knot per hour. Barometer, 29.97; temperature of air, 81°; of water, 79°; of water, at 10 feet 6 inches depth, 79°. Winds: S. ½ E., S. S. E., S. E. by E. Light winds and pleasant weather; stood E. S. E. ½ E. 8 hours.

Oct. 29. Lat. 0° 03′ N.; long. 34° 58′ W. Current, N. W. by W., 1 knot per hour. Barometer, 29.95; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: S. E., S. S. E., S. E. by S.; moderate breeze and cloudy. I am now on the line, after a passage of 46 days, and so far west that I shall fall to leeward of St. Roque, no doubt; and the question arises in my own mind, could I have done better by taking some other course? I have all faith in Maury's Book and Charts; I think I have followed them as far as possible. But if I have made no mistake in the route, mine is a hard case.

I have not had a whole sail breeze eight consecutive hours since leaving New York. No trade either N. E. or S. E., until this day; for the wind has been so light and baffling, for three days back, that it could hardly deserve the name of trade-winds, and I have not, nor do now dare to stand east, for fear of the strong current, and that I shall lose the wind again.

Oct. 30. Lat. 1° 40′ S.; long. 36° 00′ W. Current, N. W., 1 knot per hour. Barometer, 29.98; temperature of air, 80°; of water, 78°; water, at 10 feet 6 inches depth, 78°. Winds: S. S. E., S. E. by E., S. E.; moderate and cloudy, middle squally. Heavy dew.

Oct. 31. Lat. 3° 33′ S.; long. 36° 40′ W. Barometer, 29.98; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: S. E., S. E. by E., S. E.; moderate and cloudy; middle squally. Heavy dews.

Nov. 1. Lat. 4° 43′ S.; long. 36° 54′ W. Current, W. N. W., ½ knot per hour. Barometer, 29.97; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: S. E., E. S. E., E. S. E.; moderate and clear. At 3 A. M. tacked to the N. E., in 9 fathoms of water. At 7 A. M. tacked south at 12 M. Point de Mel bore S. ½ W. 12 miles.

Nov. 2. Lat. 4° 47′ S.; long. 36° 24′ W. Current, W. N. W., ½ knot per hour. Barometer, 29.97; temperature of air, 82½°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: E., E., E. All this day making short tacks from the land, and into 7 fathoms on St. Roque Banks.

Nov. 3. Lat. 4° 45′ S.; long. 36° 02′ W. Current, W. N. W., ½ knot per hour. Barometer, 29.96; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: E., E., E. All this day making short tacks from the land, and into 7 fathoms on St. Roque Banks.

Nov. 4. Lat 4° 43′ S.; long. 35° 33′ W. Current, W. N. W., ½ knot per hour. Barometer, 29.96; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 78½°. Winds: E., E., E. All this day making short tacks from the land, and into 7 fathoms on St. Roque Banks.

Nov. 5. Lat. 4° 47′ S.; long. 35° 08′ W. Current, N. W., ½ knot per hour. Barometer, 29.96; temperature of air, 82°; of water, 79½°; water, at 10 feet 6 inches depth, 79½°. Winds: E. S. E., E. S. E., E. S. E. Light winds, clear; making short tacks off the land, in 7 fathoms of water, on St. Roque Banks.

Nov. 6. Lat. 5° 44′ S.; long. 35° 05′ W. Current, N. W. by N., 1 knot per hour. Barometer, 29.95; temperature of air, 81°; of water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: E. S. E., E. S. E., E. S. E. I am now south of St. Roque, and in the five days I have been beating, I have not had one hour's stout wind, but less current than north of the line. I have been on the bank every tack, and in one instance into 4 fathoms, off Point Calcanhar: I think the soundings in the vicinity of the banks are correct in many places.

Nov. 7. Lat. 6° 20′ S.; long. 34° 50′ W. Current, N. N. W., ¾ knot per hour. Barometer, 29.99; temperature of air, 80°; of water, 79: water, at 10 feet 6 inches depth, 79°. Winds: S. E., E. S. E., S. E. by E. Light winds and clear. Tacked twice near the land.

Nov. 8. Lat. 6° 40′ S.; long. 34° 37′ W. Current, N. N. W., ½ knot per hour. Barometer, 30.01;

temperature of air, 81°; water, 79°; water, at 10 feet 6 inches depth, 79°. Winds: S. S. E., S. E. by E. Light winds and clear; tacked several times as the wind varied a point or two.

Nov. 9. Lat. 7° 50′ S.; long. 34° 42′ W. Current, N., ½ knot per hour. Barometer, 30.03; temperature of air, 81°; of water, 79½°; water, at 10 feet 6 inches depth, 79½°. Winds: S. E. by E., E. S. E., E. S. E. At 10 P. M. had a squall from N. E. for half an hour, attended with heavy rain. Remainder of the day clear, with light wind.

This tack is not quoted as an illustration of the route; for the vessel, as it appears from the captain's letter, had sustained injuries to her bottom by striking aground, which injured her sailing. This abstract, however, may be studied with profit by those who are making an October passage, for it gives much information touching the winds, &c., during that month.

Annie Buckman (Barber), New York to Canton, nineteen days out.

Oct. 18, 1852. Lat. 16° 39′ N.; long. 30° 50′ W. Barometer, 29.9; temperature of air, 82°; of water, 80°. Winds: E. S. E. to S. W., calm, and east. Good breeze; night wind baffling to S. E. and S. W., quite light; 4 A. M., calm; ends light airs from the east.

Oct. 19. Lat. 15° 02′ N.; long. 30° 29′ W. Barometer, 29.9; temperature of air, 82°; of water, 81°. Winds: E., E. by S., E. S. E. Light winds and fair weather all day. Several current ripples, but have had no current.

Oct. 20. Lat. 13° 28′ N.; long. 30° 05′ W. Barometer, 30.00; temperature of air, 82°; of water, 81°. Winds: E. by S., E. S. E., E. S. E. Light winds and overcast: light showers passing over us from westward without the wind's hauling. Latter part, moderate and pleasant.

Oct. 21. Lat. 10° 46′ N.; long. 29° 46′ W. Barometer, 30.00; temperature of air, 83°; of water, 82°. Wind: E. S. E. Moderate breeze and passing squalls all day.

Oct. 22. Lat. 8° 24′ N.; long. 29° 15′ W. Barometer, 29.9; temperature of air, 83°; of water, 82°. Winds: E. S. E., E. by S., E. S. E. to S. Moderate and pleasant; right good breeze; latter part, unsteady, baffling, with light showers.

Oct. 23. Lat. 7° 30′ N.; long. 29° 43′ W. Barometer, 29.9; temperature of air, 82°; of water, 82°. Winds: S., S. S. E., S. S. E. Light winds and calm; night, same; latter part, moderate breeze.

Oct. 24. Lat. 6° 43′ N.; long. 29° 33′ W. Barometer, 29.9; temperature of air, 82°; of water, 82°. Winds: S. by E., S. S. W., calm; strong breezes. 8 P. M. tacked to S. E. Night rainy, with squalls; latter part, calm; and a bad bubble of southerly sea.

Oct. 25. Lat. 6° 18′ N.; long. 29° 5′ W. Current, 20 miles, S. E. Barometer, 29.9; temperature of air, 84°; of water, 82°. Winds: calm, all round calm; calm and hazy; night, light squalls all around; latter part, calm. The ship has not gone more than 20 miles through the water all day.

Oct. 26. Lat. 5° 32′ N.; long. 28° 50′ W. Current, 18 miles, S. by W. Barometer, 29.9; tempera-

ture of air, 83°; of water, 82°. Winds: calm, S. W., S. W. Calm in the beginning; during the night and latter part, very faint airs from S. W.

Oct. 27. Lat. 4° 55′ N.; long. 28° 29′ W. Current, 15 miles, S. Barometer, 29.9; temperature of air, 81°; of water, 82°. Winds: S. W., S. S. W., S. S. W. Very light airs all day; hardly steerage way; during the night, heavy showers; wind baffling from west to south.

Oct. 28. Lat. 4° 43′ N.; long. 27° 39′ W. Barometer, 29.9; temperature of air, 82°; of water, 82°. Winds: S. S. W., S. W., S. Light winds and squally, with plenty of rain; at times, nearly calm; a heavy southerly swell.

Oct. 29. Lat. 3° 38′ N.; long. 28° 40′ W. Barometer, 29.9; temperature of air, 81°; of water, 82°. Winds: S., S. by E., S. by E. First six hours squally; during the night and latter part, moderate and pleasant. Stood to eastward first three hours, then S. W. by W.

Oct. 30. Lat. 2° 20′ N.; long. 30° 6′ W. Barometer, 29.9; temperature of air, 80°; of water, 82°. Winds: S. by E., S. S. E., S. S. E., calm, S. by E. Unsteady breezes, with showers, from S. E. to S., every few minutes; calm for three hours.

Oct. 31. Lat. 1° 10′ N.; long. 31° 2′ W. Barometer, 29.9; temperature of air, 81°; of water, 82°. Winds: S. by E., S. S. E., S. E. by S. Moderate and fair weather. Stood 5½ hours to the eastward; tacked to the southward and westward at midnight.

Nov. 1. Lat. 55′ S.; long. 32° W. No current. Barometer, 29.9; temperature of air, 82°; of water, 82°. Winds: S. E., S. E., S. E. to S. S. E. Moderate breezes and pleasant. Crossed the equator about midnight, 35½ days from New York, in long. 31° 30′. Stood to the eastward the last two hours. My last three passages have been 27, 28, 27 days; in all of which, I went as far east as 26°, and crossed east of 29°. This time there was no choice; go ahead or beat.

[And you did right.]

Nov. 2. Lat. 3° 14′ S.; long. 31° 38′ W. No current. Barometer, 29.9; temperature of air, 80°; of water, 80°. Winds: S. S. E. to S. E., E. by S., E. Moderate trades and pleasant. Stood to the eastward 2 hours; tacked to the southward at 2 P. M. During the night and latter part, good breezes.

Nov. 3. Lat. 6° 19′ S.; long. 31° 42′ W. Barometer, 29.9; temperature of air, 80°; of water, 80°. Wind: E. to E. S. E. all day. Good breeze and fine weather. Steering south most of the time, wind free. No current since crossing the equator.

Nov. 4. Lat. 9° 34′ S.; long. 31° 31′ W. Barometer, 29.9; temperature of air, 80°; of water, 80°. Winds: E. by S., E. by S., E. Good breezes and fine weather. This is the first time I ever made a south course from the equator to this latitude. We might have made easting, the wind being free on a south course. No current. Longitude ☉ and ☾ comes within 9 miles of chronometer.

Robert Wing (L. Crowell), New York to Buenos Ayres, fifteen days out.

Oct. 18, 1852. Lat. 20° 21′ N.; long. 44° 31′ W. Temperature of air, 83°; of water, 83°. Winds: E. by S., E. S. E., S. E. Very fresh breezes, attended with squalls of wind and rain, with high sea from

S. E.; wanting to make more easting; wind hung very obstinate to E. S. E.; am afraid the wind may hang on too long to cross the equator where I intended; I never knew the trades to work so far to the southward and eastward at this or any other season.

Oct. 19. Lat. 18° 40′ N.; long. 43° 30′ W. Temperature of air, 84°; of water, 83°. Winds: E. S. E., E., E. Fresh breezes, with hard squalls of rain; very bad appearances; bad sea running from S. E.

Oct. 20. Lat. 17° 40′ N.; long. 43° 08′ W. Temperature of air, 85°; of water, 82°. Winds: E. by N., E. by S., E. S. E. Fresh breezes, with hard squalls of wind and rain. Latter part, pleasant.

Oct. 21. Lat. 16° 51′ N.; long. 42° 07′ W. Temperature of air, 85°; of water, 82°. Winds: S. S. E., S., S. by W. Light winds and pleasant; wind varying from E. S. E. to S. and S. W.; have had no N. E. trade-winds hanging obstinately at S. and E.

Oct. 22. Lat. 17° 15′ N.; long. 40° 36′ W. Temperature of air, 84°; of water, 82°. Winds: S. by W., S., S. S. E. Moderate breezes and pleasant; wind varying from S. by W. to S. E.; very dull prospects, not finding any trades; wind hanging obstinately at southward and eastward.

Oct. 23. Lat. 16° 08′ N.; long. 40° 09′ W. Temperature of air, 84°; of water, 82°. Winds: E. by N., E. by N., east. Moderate breezes and pleasant; all sail set.

Oct. 24. Lat. 14° 17′ N.; long. 39° 00′ W. Temperature of air, 83°; of water, 82½°. Winds: E., E., E. by S. Moderate breezes and pleasant; all sail set.

Oct. 25. Lat. 12° 22′ N.; long. 38° 55′ W. Temperature of air, 85°; of water, 82°. Winds: E. S. E., E. S. E., S. E. First part, fresh breezes, E. S. E., with squalls; middle and latter part, moderate, winds baffling from S. W. to E.; tacked to make easting when opportunity offers; appearances of strong current; heavy tide rips.

Oct. 26. Lat. 12° 12′ N.; long. 38° 55′ W. Temperature of air, 84°; of water, 82°. Winds: calm, calm, S. E. First and middle parts, calm; latter part, light airs from S. E. to N.; 11 to 12, heavy rain.

Oct. 27. Lat. 11° 31′ N.; long. 38° 30′ W. Temperature of air, 83°; of water, 83°. Winds: east, E. S. E., E. by S. Light baffling airs from E. N. E. to S. E.; pleasant weather; very heavy tide rips, more so than I have ever seen in the Atlantic, equal to the rippling on George's Bank, yet I have not experienced any current about here.

Oct. 28. Lat. 10° 05′ N.; long. 37° 45′ W. Temperature of air, 86°; of water, 84°. Winds: E. S. E., E. by S., S. E. Fresh breezes and pleasant; middle and latter, baffling airs from E. N. E. to S. E.; heavy tide rips. Barque steering north. Air, E. N. E. Current, 15 miles during last 24 hours.

Oct. 29. Lat. 8° 11′ N.; long. 36° 29′ W. Temperature of air, 86°; of water, 84°. Winds: E. by N., E. by N., E. by S. Fine breezes and pleasant, with occasional light squalls of rain; 25 miles easterly current.

Oct. 30. Lat. 7° 17′ N.; long. 35° 58′ W. Temperature of air, 85°; of water, 84°. Winds: E., E. S. E., S. E. First and middle part, light variable winds; latter part, fresh breezes, heavy appearances.

Oct. 31. Lat. 5° 31′ N.; long. 36° 12′ W. Temperature of air, 85°; of water, 84°. Winds: E. S. E., S. E., S. E. First part, fresh breezes; middle and latter, baffling from E. to S.; bad rain squalls.

Nov. 1. Lat. 5° 07′ N.; long. 35° 09′ W. Temperature of air, 84°; of water, 84°. Winds: E., E. by S., E.; light variable winds, from E. to S. E. with squalls; tacked several times, to take advantage of starts of wind, having had very bad chances to make easting when I wished, not getting any N. E. trade.

Nov. 2. Lat. 3° 12′ N.; long. 34° 35′ W. Temperature of air, 84°; of water, 82°. Winds: E. S. E., E. N. E., S. E.; light breezes and pleasant, from E. S. E. to S. E.; tacked three times, to make slants to the east. I have had 120 miles easterly current between lat. 11° 30′ and 3° N. in five days. Here, I should recommend a vessel to make her easting, in case the S. E. trades reach as far north as this parallel, as they have with me. I shall stand on for Cape St. Roque, rather than tack back to the N. and E.

Nov. 3. Lat. 2° 07′ N.; long. 35° 08′ W. Temperature of air, 83°; of water, 82°. Winds: E. S. E., S. E., S. E.; light winds and squalls; find it very difficult to make easting, unless making too much northing, having had no chance for a slant. The most unfavorable chance I ever saw.

Nov. 4. Lat. 00° 12′ S.; long. 35° 45′ W. Temperature of air, 82°; of water, 82°. Wind: S. E.; fresh breezes and clear. I have availed myself of every opportunity to make easting, since I first entered the region of the N. E. trade-winds, but have found none—a very singular occurrence; have very unwillingly crossed the equator in 35° 45′. Shall stand on for the land, unless I am favored with a slant; shall evidently fetch to leeward of Cape St. Roque; this I expected when I found the N. E. trades to fail me. If I fall to leeward of Cape St. Roque, it will not be the fault of Lieut. Maury, unless he can govern the elements; this we do not look for him to do; although the great improvements for navigators that he has been so attentive to, are indeed wonderful. No current.

Nov. 5. Lat. 2° 35′ S.; long. 35° 51′ W. Temperature of air, 80°; of water, 82°. Winds: S. E., S. E. by E., E. by S.; fresh breezes and pleasant; standing on for the land.

Nov. 6. Lat. 4° 48′ S.; long. 36° 08′ W. Temperature of air, 82°; of water, 78°. Winds: E. S. E., E. by S., E. by S.; fresh breezes, and clear. At 11 A. M., the water discolored; at 11 hours 30 min. saw the land 60 miles to the leeward of Cape St. Roque; meridian, on the reef; saw breakers ½ mile distant to S. W.; tacked off the land; the land here is low and sandy; but there is no danger with a good lookout; you can always tell by the water, as it becomes *white* as you near the Bank. A barque in sight, standing in.

Nov. 7. Lat. 4° 09′ S.; long. 35° 07′ W. Temperature of air, 82°; of water, 80°. Winds: S. E. by S., S. E., S. S. E. Fine breezes and pleasant; middle and latter part moderate. At 6 A. M. tacked to the southward. This is the first chance I have had to make a start to the eastward, for fifteen days.

Nov. 8. Lat. 5° 11′ S.; long. 35° 15′ W. Temperature of air, 83°; of water, 81½°. Winds: S. E., S. E. by E., S. E. First part, moderate breezes; middle and latter part, fine breezes and clear. At 5 P. M. tacked to the E. N. E. two hours; tacked to the southward, stood five hours; stood E. N. E. four hours; tacked to, eight hours. At 11 hours 30 min. A. M., water discolored; stood in to ten fathoms; saw the land, Point Calcanhar, bearing W. by N. 6 miles; found no difficulty in making to windward. Current, half mile, W. N. W.

Nov. 9. Lat. 5° 52′ S.; long. 35° 05′ W. Temperature of air, 84°; of water, 80°. Wind: S. E. Fresh

breezes and pleasant; high sea from S. E.; standing off and on in shore; working along the coast; find the sounding quite regular, from 7 to 12 fathoms; reef showing very plain; little or no current about here.

Nov. 10. Lat. 6° 35′ S.; long. 35° 05′ W. Temperature of air, 84°; of water, 80°. Winds: S., S. S. E., S. E. by S. Fresh breezes and pleasant; working all along the coast. This has been a very unfavorable chance for any vessel to work up the coast; notwithstanding, I have made as much headway as I could have expected to, on the coast of North America; and I would also say that one need not fear Cape St. Roque, unless it is much different from what I found it. I shall always aim to cross the equator west of 31°, being sure that there is but little current about this cape.

Nov. 11. Lat. 6° 41′ S.; long. 34° 00′. Temperature of air, 85°; of water, 80°. Winds: S. S. E., S. E., S. S. E. Fresh breezes and fine weather. Working up the coast; wind obstinate at S. S. E., and S. E.

Nov. 12. Lat. 7° 56′ S.; long. 34° 27′ W. Temperature of air, 83°; of water, 80°. Winds: S. E., S. E., S. E. by S. Light breezes and fine weather. Saw several catamarans. Land in sight, off Pernambuco. This is the sixth day since I first made the land sixty miles to leeward of Cape St. Roque; have worked nearly dead to windward.

Up to this time she had had the winds from the westward, principally from the northward and westward. She did not take sufficient advantage of them, and therefore crossed the equator farther to the westward than it is desirable to do. Nevertheless, her abstract proves that, by crossing as far west as 36°, one is not hopelessly to leeward.

It is very easy, after one sees how the winds have been, to say what the course should have been. But I hope navigators will not regard my critiques upon their tracks, ever, in an offensive light. We must profit each by the experience of others; and, though Captain Crowell did keep to the west of the track prescribed, it does not, therefore, follow that he is to blame. Whether the navigator be to blame or not, is no concern of mine. It is my aim to give sailing directions, and to lay them down so clearly that all who will, may understand them. And I know no better way of doing this than by making examples teach by the experience which others are kind enough to spread before me.

Though Captain Crowell did "stick her away south" sooner than in my judgment it was advisable, yet he had no cause to regret it. He gained upon the old route some ten or fifteen days, and in a week afterwards he was running off with topmast studding-sails set, with Cape St. Roque a long way off under his lee.

Ship Capitol (Gorham), Richmond, to San Francisco, 16 days out.

Nov. 4, 1852. Lat. 19° 36′ N.; long. 34° 53′ W. Squally, E., S. E.

Nov. 5. Lat. 17° 16′ N.; long. 33° 55′ W. Moderate breezes, E. by S.

Nov. 6. Lat. 14° 54′ N.; long. 33° 08′ W. Moderate breezes, E.

Nov. 7. Lat. 12° 34′ N.; long. 32° 20′ W. Fresh breezes, E. by S.

Nov. 8. Lat. 10° 06′ N.; long. 31° 10′ W. Squally, E., E. N. E., N. E.

Nov. 9. Lat. 8° 04′ N.; long. 30° 38′ W. Squally, with rain, E., S. E., E.

Nov. 10. Lat. 7° 35′ N.; long. 29° 58′ W. Squally, with rain, E., S. E., E. by S.

Nov. 11. Lat. 6° 39′ N.; long. 29° 30′ W. Squally, with rain, S. E., E. S. E., E. N. E.

Nov. 12. Lat. 5° 29′ N.; long. 29° 04′ W. Squally, with rain, N. E., E., S. E.

Nov. 13. Lat. 4° 51′ N.; long. 28° 52′ W. Light and baffling, S. S. E., N. E., S. E.

Nov. 14. Lat. 3° 45′ N.; long. 28° 50′ W. Squally, S. E., E., N. E.

Nov. 15. Lat. 2° 47′ N.; long. 29° 35′ W. Squally, S. E., E. N. E., E. N. E.

Nov. 16. Lat. 2° 31′ N.; long. 30° 00′ W. Calm, and rain squalls, baffling airs.

Nov. 17. Lat. 1° 01′ N.; long. 30° 15′ W. Moderate breezes, S. S. W., S. E. by E., E.

Nov. 18. Lat. 1° 18′ S.; long. 31° 16′ W. Moderate breezes, S. E.

Nov. 19. Lat. 3° 49′ S.; long. 32° 16′ W. Moderate breezes, S. E.

Nov. 20. Lat. 6° 37′ S.; long. 33° 19′ W. Moderate breezes, S. E.

Ship George Raynes, Boston to San Francisco, twenty-two days out.

Nov. 4. Lat. 22° 00′ N.; long. 27° 18′ W. Winds: E. N. E., E., E. by S. First part, squally; latter part, moderate breezes.

Nov. 5. Lat. 18° 15′ N.; long. 26° 50′ W. Wind: E. Fine weather.

Nov. 6. Lat. 15° 58′ N.; long. 26° 40′ W. Wind: E. Pleasant breezes.

Nov. 7. Lat. 13° 06′ N.; long. 26° 40′ W. Wind: E. Pleasant breezes.

Nov. 8. Lat. 10° 15′ N.; long. 26° 34′ W. Winds: E., E. N. E., E. N. E. During the night, sharp lightning to S. E.; at noon, wind hauled to S. E. in a squall.

Nov. 9. Lat. 8° 30′ N.; long. 26° 20′ W. Winds: E. S. E., S. E., E. S. E. Begins with moderate breezes; middle part, squally. Ends light breezes.

Nov. 10. Lat. 7° 34′ N.; long. 26° 44′ W. Winds: S. S. E., calm, E. First part, light airs; middle, calm; latter part, light airs.

Nov. 11. Lat. 6° 32′ N.; long. 26° 36′ W. Winds: E., E. N. E. Light airs and calms; considerable lightning in S. and N. E.

Nov. 12. Lat. 5° 26′ N.; long. 26° 48′ W. Winds: E., E. S. E., calm. Begins calm with rain; at 8 P. M. wind hauled in, squall to S. E. Ends calm.

Nov. 13. Lat. 4° 55′ N.; long. 27° 04′ W. Winds: E. S. E., S. S. E., calm. Light airs.

Nov. 14. Lat. 3° 27′ N.; long. 27° 18′ W. Winds: E. S. E., S. E. First part, squally; middle, light breezes; latter, moderate breezes.

Nov. 15. Lat. 2° 07′ N.; long. 28° 00′ W. Winds: S. E. by S. Moderate breezes and squally.

Nov. 16. Lat. 1° 15′ S.; long. 28° 42′ W. Winds: S., S. S. E. Light breezes.

Nov. 17. Lat. 0° 02′ S.; long. 29° 00′ W. Winds: S. S. E., S. E. Moderate breezes and fine weather.

Nov. 18. Lat. 2° 06′ S.; long. 29° 24′ W. Winds: S. E., E. S. E., S. E. by E. Steady breezes.

Nov. 19. Lat. 4° 44′ S.; long. 30° 55′ W. Winds: S. E. by E., S. E. Steady breezes.

Nov. 20. Lat. 7° 40′ S.; long. 31° 50′ W. Winds: S. E., E. S. E. Steady breezes.

Brig Georgiana (Chase), New York to Mozambique, eighteen days out.

Nov. 13, 1851. Lat. 20° 04′ N.; long. 31° 13′ W. Winds: S. W., S. S. W. Fresh breezes and fine weather.

Nov. 14. Lat. 19° 54′ N.; long. 29° 24′ W. Wind: S. S. W. Light breezes with fine clear weather.

Nov. 15. Lat. 18° 35′ N.; long. 29° 53′ W. Winds: S., S. S. W. Light airs and cloudy.

Nov. 16. Lat. 17° 52′ N.; long. 30° 25′ W. Winds: calm, S. S. W., calm. Cloudy weather.

Nov. 17. Lat. 15° 55′ N.; long. 30° 14′ W. Winds: S. S. W., S., S. E. First part, light; latter, fresh breezes.

Nov. 18. Lat. 13° 49′ N.; long. 29° 56′ W. Winds: S. E., E. S. E., E. S. E. Pleasant gales and fair.

Nov. 19. Lat. 10° 55′ N.; long. 29° 00′ W. Winds: E., E. by N. Fresh trades.

Nov. 20. Lat. 8° 26′ N.; long. 28° 04′ W. Winds: E. N. E., N. E. by E. Pleasant gales.

Nov. 21. Lat. 5° 39′ N.; long. 27° 05′ W. Wind: E. N. E. First part, fresh breezes and pleasant; latter part, light and squally.

Nov. 22. Lat. 4° 55′ N.; long. 27° 35′ W. Winds: S., W. S. W., S. W. Light and baffling airs; clear weather.

Nov. 23. Lat. 4° 01′ N.; long. 27° 20′ W. Winds: S., S. S. W., W. S. W. Light baffling airs with heavy rain squalls.

Nov. 24. Lat. 2° 33′ N.; long. 28° 41′ W. Winds: S. E. by E., S. E. Strong breezes; very heavy squalls.

Nov. 25. Lat. 0° 10′ N.; long. 29° 40′ W. Winds: S. S. E., S. E. by S. Fresh breezes and fine weather.

Nov. 26. Lat. 1° 35′ S.; long. 30° 35′ W. Wind: S. E. Fine breezes and pleasant.

Nov. 27. Lat. 4° 06′ S.; long. 30° 40′ W. Wind: E. S. E. Weather pleasant.

Nov. 28. Lat. 6° 59′ S.; long. 30° 30′ W. Wind: E. S. E. Fresh breezes with squalls.

Flying Fish (E. E. Nickels), Boston to San Francisco, nine days out.

Nov. 15, 1851. Lat. 21° 27′ N.; long. 37° 29′ W. Winds: N. W. to S. W.; pleasant weather; all sail.

Nov. 16. Lat. 19° 00′ N.; long. 34° 36′ W. Winds: S. W.; changeable weather.

Nov. 17. Lat. 17° 24′ N.; long. 33° 38′ W. Winds: S. W. to S. S. E.; changeable weather; all sail.

Nov. 18. Lat. 16° 21′ N.; long. 34° 38′ W. Winds: S. to S. E., light; weather unsettled, rainy; all sail.

Nov. 19. Lat. 13° 14′ N.; long. 35° 10′ W. Winds: S. E. by E., moderate; pleasant, trade-like weather.

Nov. 20. Lat. 9° 50′ N.; long. 34° 00′ W. Wind: S. E. to E., brisk; pleasant weather; all sail; two weeks out; average, 213 miles per day.

Nov. 21. Lat. 6° 34′ N.; long. 31° 55′ W. Winds: E. by S. to E. by N.; changeable weather; some rain; all sail.

Nov. 22. Lat. 5° 02′ N.; long. 30° 45′ W. Winds: E. by S., S. to S. W., moderate; changeable weather; tacked twice; all sail.

Nov. 23. Lat. 4° 58′ N.; long. 30° 07′ W. Wind: southerly; light or calm; very pleasant; all sail.

Nov. 24. Lat. 2° 31′ N.; long. 30° 48′ W. Wind: S. E., brisk; changeable weather; all sail.

Nov. 25. Lat. 0° 24′ S.; long. 32° 04′ W. Wind: S. E.; pleasant; all sail; nineteen days to the line, averaging 196 miles. Saw two American ships bound home.

Nov. 26. Lat. 2° 40′ S.; long. 32° 30′ W. Moderate winds; weather changeable and showery; all sail.

Nov. 27. Lat. 5° 04′ S.; long. 32° 50′ W. Wind: E. S. E.; pleasant weather; all sail; passed Fernando de Noronha Islands; 190 miles average.

Nov. 28. Lat. 7° 14′ S.; long. 32° 44′ W. Wind: S. E., baffling, moderate; unsettled weather; all sail. Saw a ship bound to the northward.

Ship F. W. Brune (D. C. Landis), New York to California, eighteen days out.

Nov. 18, 1852. Lat. 19° 44′ N.; long. 35° 50′ W. Barometer, 30.05; temperature of air, 79°; of water, 80°. Winds: N. to N. N. E., N. E. to S. E., E. S. E. to E.; pleasant; light squalls with rain, and smooth sea; middle part, light easterly breeze; latter part, light easterly breeze, and smooth sea. Have not seen the Sargosso this twenty-four hours. The barometer has been fluctuating for some days past, being down to 30.00 in the evening, and up to 30.05 in the morning, similar to the tide of the ocean. I have observed this before in the South Atlantic beyond the trade-winds, but never so much difference—not being more than $\frac{25}{100}$.

Nov. 19. Lat. 18° 22′ N.; long. 34° 49′ W. Variation, 12° 45′. Barometer, 30.25; temperature of air, 79°; of water, 80°. Winds: E., E., E. by S. Moderate breezes and pleasant weather. Has the appearance of a strong current by the tide rips, but did not observe any by the observations. Sea smooth.

Nov. 20. Lat. 16° 20′ N.; long. 34° 11′ W. Current, W. S. W., $\frac{1}{2}$ knot per hour. Barometer, 30.25; temperature of air, 78°; of water, 81°. Winds: E. S. E., and E. to E. S. E. First and middle parts, moderate breeze and pleasant; latter, fresh breezes and head sea; strong tide rips similar to those in the neighborhood of George's Shoals.

Nov. 21. Lat 14° 34′ N.; long. 32° 53′ W. No current. Barometer, 30.5; temperature of air, 80°; of water, 81°. Wind: E. Pleasant weather; large swell from S. E. Did not observe any current.

Nov. 22. Lat. 12° 40′ N.; long. 31° 15′ W. Current, west, $\frac{3}{4}$ of a knot per hour. Barometer, 30;

temperature of air, 80°; of water, 81°. Winds: E. to E. N. E. First and middle parts, fresh breezes; calm and pleasant weather; heavy head sea; latter part, moderate and hazy.

Nov. 23. Lat. (D. R.) 11° 12′ N.; long. 30° W. Barometer, 29.95; temperature of air, 78°; of water, 80°. Winds: E., E., E. S. E. Moderate breezes and unpleasant weather; not so much swell; latter part, heavy dark appearance to the southward, and I think the trade-wind is done; which is certainly farther north than I ever lost them before at this season of the year, though I have been 5° farther east.

Nov. 24. Lat. 10° 5′ N.; long. 28° 50′ W. Barometer, 29.95; temperature of air, 78° of water, 81°. Winds: E. to S. S. E., E. by N., E. First part, cloudy gloomy weather; light baffling breezes; middle, moderate and unsteady; latter, light and pleasant; some swell.

Nov. 25. Lat. 8° 20′ N.; long. 27° 12′ W. Current, N. W., ¾ knot per hour. Barometer, 29.95; temperature of air, 80°; of water, 81°. Winds: E. to E. N. E. Fine breezes and pleasant. Still looks as though we were in the middle of the trades; but I do not think they will remain with us much longer.

Nov. 26. Lat. (D. R.) 6° 45′ N.; long. (D. R.) 26° 12′ W. Barometer, 29.90; temperature of air, 80°; of water, 80°. Winds: E., E., and S. First part, moderate and pleasant; ends squally and baffling; a heavy turbulent swell.

Nov. 27. Lat. 6° 9′ N.; long. 26° 13′ W. Barometer, 29.90; temperature of air, 81°; of water, 81°. Winds: S. to E., S. to E., E. S. E. Squally weather, with baffling winds; heavy swell from the south.

Nov. 28. Lat. 5° 13′ N.; long. 26° 30′ W. Current, N. W., 1 knot per hour. Barometer, 29.95; temperature of air, 81°; of water, 81°. Winds: E. S. E. to S. S. E. Squally, with light baffling breezes; heavy swell from the south.

Nov. 29. Lat. (D. R.) 4° 23′ N.; long. (D. R.) 26° W. Barometer, 29.90; temperature of air, 81°; of water, 81°. Winds: S. S. E. to E. S. E. Light winds and squally; swell from S. E.

Nov. 30. Lat. (D. R.) 3° 38′ N.; long. (D. R.) 26° 30′ W. Barometer, 29.90; temperature of air, 78°; of water, 82°. Winds: S. S. E. to E., S. S. E. to E., S. S. E. to E. S. E. Light baffling winds; squally and showery; heavy head swell.

Dec. 1. Lat. 2° 45′ N.; long. 27° 25′ W. Current, ½ knot, W. Barometer, 29.70; temperature of air, 78°; of water, 82°. Winds: S. S. E. to S. E., calm, S. by E. First part, light baffling airs; middle and latter, squally; heavy head swell.

Dec. 2. No observations. No current. Barometer, 29.90; temperature of air, 77°; of water, 82°. Winds: S., S., E. N. E. to E. S. E. Moderate breezes and squally weather. Still heavy swell from S. E.

Dec. 3. Lat. 1° 27′ N.; long. 27° 55′ W. Barometer, 29.9; temperature of air, 84°; of water, 82°. Winds: calms, and squalls, S. by E. First and middle parts, cloudy, squally weather; latter part, more settled; a heavy head sea.

Dec. 4. Lat. 00° 44′ N.; long. 28° 13′ W. Current, 1 knot, W. N. W. Barometer, 29.95; temperature of air, 84°; of water, 82°. Winds: S., S. and S. by E. Moderate winds, and squally; the wind some-

times S. S. W.; pleasant weather; has the appearance of the trade-winds; God knows it is nearly time we had them; must have had a strong current to the westward, these three days past; heavy swell.

Dec. 5. Lat. 00° 56′ S.; long. 29° 20′ W. Current, ½ knot, W. N. W. Barometer, 29.95; temperature of air, 83°; of water, 79°. Winds: S. by E., S. S. E., S. S. E. Light breezes, and pleasant; large head swell.

Dec. 6. Lat. 2° 48′ S.; long. 30° 35′ W. Current, ½ knot, per hour, W. Barometer, 29.95; temperature of air, 83°; of water, 79°. Wind: S. S. E. Light winds, and pleasant weather; close by the wind; heavy head swell.

Dec. 7. Lat. 3° 30′ S.; long. 31° 40′ W. Current, 1 knot per hour, W. N. W. Barometer, 29.95; temperature of air, 82°; of water, 79°. Winds: S. by E., S. by E., S. S. E. Moderate and pleasant; some swell; the wind hanging far south. Latter part, squally appearances. Birds around.

Dec. 8. Lat. 5° 37′ S.; long. 31° 33′ W. Current, none. Barometer, 29.92; temperature of air, 82°; of water, 79°. Wind: S. E. by S. Moderate and pleasant; smooth sea.

Dec. 9. Lat. 8° 00′ S.; long. 32° 41′ W. Current, ¾ knot per hour, west. Barometer, 29.95; temperature of air, 83°; of water, 79°. Winds: S. E. by S., S. E., S. E. by E. Fine breezes and smooth sea.

Dec. 10. Lat. 10° 47′ S.; long. 33° 01′ W. No current. Barometer, 30.00; temperature of air, 82°; of water, 80°. Winds: S. E. by E., S. E. by E., E. by S. Fine breezes and a smooth sea.

Dec. 11. Lat. 13° 56′ S.; long. 33° 20′ W. Current, ½ knot per hour, south. Barometer, 30.00; temperature of air, 80°; of water, 80°. Winds: S. E. by E., S. E. by E., E. Fine breezes. The barometer fluctuating $\frac{50}{100}$, which I never observed before in the heart of the trades. Smooth sea.

Danube, New York to San Francisco, twelve days out.

Nov. 25, 1852. Lat., at noon, 24° 29′ N.; long. 42° 16′ W. Barometer, 30.10; temperature of air, 71°; of water, 73°. Moderate breeze all round the compass, and very dark, no one hour from one point. Evidently a very strong current setting S. W. No part of the 24 hours has ship's head been to south of S. S. E. Sharp lightning at S. E. Observations of yesterday and to-day, good. Ship, when heading E. N. E. and S. S. E., carrying strong starboard helm. Strong ripplings like tide rips. Large quantities of dead-looking brown gulf-weed; no fish; no birds. Heavy swell from N. W.; frequent rain squalls from W. S. W. to S. E. Current, 1 mile per hour, S. W.

Nov. 26. Lat. 24° 29′ N.; long. 40° 29′ W. Barometer, 30.10; temperature of air, 76°; of water, 76°. Winds: S. S. E., S. by E., S. Fresh breeze; close atmosphere; no lightning; trade-clouds; 19′ W. S. W. current. Observations good.

Nov. 27. Lat. 24° 49′ N.; long. 37° 27′ W. Barometer, 30.05; temperature of air, 75°; of water, 75°. Wind: S. by E. throughout the day. Fresh breeze; gulf-weed; flying fish; lead colored clouds.

This vessel was quite far enough to the eastward for her latitude; and had the wind been fair, she could not have wished a better than a south course. She should have beat across this belt, and should

have gone in search of a wind, instead of dallying along in this calm place waiting for a wind to come to her.

Nov. 28. Lat. 25° 25′ N.; long. 35° 27′ W. Barometer, 30.05; temperature of air, 74°; of water, 74°. Winds: S. by E., S. by E., S. E. Hard, long, heavy squalls; double reefs. Much gulf-weed.

Nov. 29. Lat. 23° 49′ N.; long. 36° 40′ W. Barometer, 30.00; temperature of air, 75°; of water, 75°. Winds: S. E., S. S. E., S. E. Much lightning at S. E.; heavy, hard-looking weather. During the 24 hours, the wind has varied from S. to S. E. Alternate calms and hard squalls; gulf-weed in abundance. Flying fish, but no birds.

Nov. 30. Lat. ——; long. ——. Barometer, 30.00; temperature of air, 72°; of water, 75°. Winds: all around the compass; very dark; heaviest kind of thunder and lightning, and hard, steady rain, with frequent and sudden heavy squalls from S. E. to S. S. E., S., S. W., back to S. E., calm; then very heavy from N. W.; then N.; then E. N. E.; then N. E., with steady rain, heavy thunder, sharp chain lightning. This noon it blows a gale from N. E.; am now in hopes the weather will change; close reefs; have now had the winds from the south for thirteen days.

Dec. 1. Lat. 21° 34′ N.; long. 36° 04′ W. Barometer, 30.00; temperature of air, 74°; of water, 75°. Winds: N. E. to E., S. S. E., S. S. E.

Dec. 2. Lat. ——; long. ——. Barometer, 30.00; temperature of air, 75°; of water, 76°. Winds: S. S. E., S., S. Extremely dark and squally; barely see the lines to write in front of a four-paned window. The squalls have not been so heavy this 24 hours as previously, although the rain continues unabated; no gulf-weed, no birds, and no observations; every appearance of a strong westerly current; almost impossible to keep dead reckoning, as the squalls run in all manner of ways.

Dec. 3. Lat. 21° 57′ N.; long. 34° 00′ W. Barometer, 30.05; temperature of air, 74°; of water, 76°. Winds: S., variable, S. W., S. S. E.; Dark, inky-looking weather; the current has set to the westward, I should judge, full 1′ per hour.

Dec. 4. Lat. 21° 29′ N.; long. 33° 57′ W. Barometer, 30.00; temperature of air, 75°; of water, 76°. Winds: S., S. S. E., S. E., S. E., S. S. W., S. W. Variable.

Dec. 5. Lat. 20° 49′ N.; long. 35° 05′ W. Barometer, 30.00; temperature of air, 76°; of water, 76°; variable winds from S. to E.

Dec. 6. Lat. 20° 24′ N.; long. 35° 06′ W. Current, ½ knot per hour, W. by N. Barometer, 30.10; temperature of air, 75°; of water, 76°. Winds: E., S. E., E.; very light airs, sometimes dead calm.

Dec. 7. Lat. 20° 20′ N.; long. 35° 06′ W. Barometer, 30.00; temperature of air, 75°; of water, 76°; calm.

Dec. 8. Lat. 17° 50′ N.; long. 34° 06′ W. Barometer, 30.10; temperature of air, 75°; of water, 76°. Winds: E. S. E., E., E. S. E.; trades at last; fine breeze.

Dec. 9. Lat. 16° 00′ N.; long. 33° 10′ W. Barometer, 30.10; temperature of air, 76°; of water, 76°. Winds: E. S. E., S., S. W., E. S. E.; gone again; clear trade looking westward.

Dec. 10. Lat. 12° 18′ N.; long. 32° 00′ W. Barometer, 30.00; temperature of air, 76°; of water, 76°. Winds: E., E. S. E., E. S. E.; fresh breeze.

Dec. 11. Lat. 7° 47′ N.; long. 32° 00′ W. Barometer, 30.00; temperature of air, 76°; of water, 76°. Wind: E. S. E. throughout; steady, fresh gale.

Dec. 12. Lat. 5° 47′ N.; long. 30° 00′ W. Barometer, 30.00; temperature of air, 76°; of water, 76°. Winds: E., E., E. N. E.; steady, fresh gale.

Dec. 13. Lat. 4° 00′ N.; long. 29° 00′ W. Barometer, 29.90; temperature of air, 77°; of water, 78°. Winds: E. S. E., S. E. by E., S. E.; first part, fresh breeze; latter part, moderate.

Dec. 14. Lat. 2° 6′ N.; long. 29° 43′ W. Barometer, 29.90; temperature of air, 78°; of water, 78°. Winds: S. E., S. E. by S., S. E. by S.; first and middle parts, very moderate; last part, fine.

Dec. 15. Lat. 1° 10′ N.; long. 30° 27′ W. Barometer, 29.90; temperature of air, 76°; of water, 77°. Winds: S. S. E. throughout; will stand on if possible; wind inclines far to the S. but varies to S. E. at times; much rain.

Dec. 16. Lat. 0° 57′ N.; long. 31° 00′ W. Current, 1¼ knots per hour, W. N. W. Barometer, 29.90; temperature of air, 76°; of water, 77°. Winds: S. S. E., S. E. by S., S. E. by S.

Dec. 17. Lat. 0° 10′ N.; long. 32° 00′ W. Current, 1½ knots per hour, W. N. W. ½ W. Barometer, 29.90; temperature of air, 76°; of water, 76°. Wind: S. S. E. throughout. Very moderate; tacked to the eastward.

Dec. 18. Lat. 0° 8′ N.; long. 30° 00′ W. Current, 1¼ knots per hour, W. by N. Barometer, 30.00; temperature of air, 77°; of water, 76°. Winds: S. S. E., S. E. ½ E., S. E. ½ E. Moderate; fine weather; large sharks, flying fish, albicore, nautilus.

Dec. 19. Lat. 0° 43′ N.; long. 29° 50′ W. Current, 38′ W. N. W. ¼ W. Barometer, 30.00; temperature of air, 77°; of water, 76°. Wind: very moderate from S. E. to S. S. E.

Dec. 20. Lat. 0° 50′ N.; long. 29° 08′ W. Current, 1⅛ knots per hour, W. ¾ N. Barometer, 30.00; temperature of air, 77°; of water, 76°. Winds: S. S. E. to S., S. to S. S. E., S. E. Tacked to the southward; very moderate weather.

Dec. 21. Lat. 1° 06′ S.; long. 29° 57′ W. Barometer, 29.90; temperature of air, 76°; of water, 76°. Wind: S. E. by S. throughout. Fine breeze.

Dec. 22. Lat. 3° 28′ S.; long. 30° 41′ W. Barometer, 29.90; temperature of air, 76°; of water, 76°. Wind: S. E. by S. throughout. A fine, steady breeze.

Dec. 23. Lat. 6° 02′ S.; long. 31° 26′ W. Barometer, 29.90; temperature of air, 76°; of water, 76°. Winds: S. E. by S., S. E. by S., S. E. by E. Fine, steady breeze. Boarded by U. S. frigate Raritan.

These tracks on the route to Rio, or Cape Horn, or Cape of Good Hope, are given, not so much for any light they themselves throw as to the passage, but because they serve, many of them at least, to illustrate the computed route of the tables; because they demonstrate the correctness of these routes, and

because they serve, or ought to serve, to give navigators confidence in the Charts and the Sailing Directions based upon them.

In reviewing these tracks, one thing will not fail to arrest the attention of the navigator, and that is, the success with which the line may be crossed as far west as 32°. Seldom, indeed, has it occurred that any vessel, after crossing the line upon that meridian, has experienced any difficulty in clearing St. Roque.

A new edition of the *Pilot Charts of the North Atlantic* is just out. The wind-roses of these Charts, south of 30° N., are now nearly all pretty well filled up.

Vessels bound from Europe to ports beyond the equator, will be guided with fidelity by these Charts along the best routes, which for the most part is plain sailing. As a rule, it will be out of their way to come west of 25°, before they reach the doldrums. In them, they should beat across rather than steer E. S. E. or W. S. W., for any length of time along them.

They should also beat when necessary, and when not, stand due south, across the calm belt of the horse latitudes.

In these Sailing Directions, dull captains, and dull ships, are ignored. In crossing the calm belts and shaving ticklish points, such ships must crab it along as best they may, for I do not pretend to give any directions that are suited to them.

TIDE RIPS.

The appearance thus designated, is a ripple in the water, such as is seen in a tide way, or at the meeting of two currents. All the information that I have upon the subject, tends to show that, in these rips, there is no current, or, at least, none which can affect the ship.

These tide rips are met, most generally, about the region of the equatorial doldrums. They are occasionally seen in other parts of the ocean. But those to which I now refer particularly, are those which almost every vessel encounters near the equator, and which are so often mentioned in the preceding abstracts.

What produces this singular appearance so constantly in this part of the ocean? Vessels sail through these rips and feel no current. How would it be with a boat? for it appears to me that the motion in the water, which produces the appearance, is a horizontal, not a vertical, motion. If the former, the question comes up, can the trade-winds produce it?

On one side of this calm belt, near the borders of which these tide rips are seen, the S. E. trade-winds are perpetually blowing; on the other, the N. E.

Each of these systems of winds operating upon the ruffled surface of the ocean day after day, through a course of two or three thousand miles, has the tendency to drive before it a gentle surface current, and to pile the water up, one on one side, the other on the other, in this calm belt, into which these two systems of winds are blowing.

We know that the wind, as is often seen, when long unbroken sheets of water are open to its sweeping force, is capable of piling the water up at one end of a long canal or pond.

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After the water is so piled up, suppose the wind should suddenly go down, what would take place? Should we not expect to see the piled up water, and not that below it, running back as a thin surface current?

These two trade-winds blow at right angles with each other (N. E. and S. E.), and may not the tide rips be caused by the accumulation of water, which the S. E. trades are driving before them, meeting with what the N. E. trades are driving before them?

Some are, perhaps, so caused; others, it may be, are produced by the water which the two trade-winds have piled up or accumulated in this calm belt, breaking loose, as it were, now here, now there, and escaping as a rippling shallow current, running, as it were, on the top of the sea. The vast amount of rain water which falls within this belt would assist both to pile up and make lighter.

This view, I am aware, has some plausibility, but it wants confirmation, and the subject is quite interesting enough to commend itself to the attention of navigators.

In what direction do these tide rips appear to run? and though the ship may not feel any current in them, will a boat? and do chips or other light substances thrown overboard show any signs of a current?

Co-operators will remember that these rips have been the subject of special inquiry for abstract logs for years, and now that light is breaking in upon us with regard to them, it is hoped that attention will not sleep, nor inquiry cease.

PLATES XI. AND XII.

The tracks with the arrows (Plates XI. and XII.), are the tracks which I have recommended, and the dotted tracks are some of the tracks which have actually been performed. They contain, also, the lanes for the steamers between Europe and America.

Now, suppose we had the tracks of a hundred ships, hence to Rio, all made in the month of January of different years; that in every instance, and with every change of wind, each one of the ships making these tracks had been managed without a mistake; that they had in every instance steered the best course possible; that when necessary to go about, each one had gone about exactly at the right moment; and that, whenever the wind came out ahead, they had all, without exception, invariably gone off on the right track; and that the tracks of these hundred vessels—no two of them having, let it be supposed, sailed in company—were projected on a chart before us. What should we have? We should probably have a hundred separate tracks, for it can scarcely be supposed that any two of them would coincide all the way. And the navigator, with that chart before him, would have displayed before him, as clear as he has the sun at mid-day in a cloudless sky, the best route to Rio in the month of January.

Now, suppose that, with these 100 tracks before us, we should wish to draw a line or describe a route, which should represent the mean average track of the entire 100 ships. We should then point to this track and say, this is the route pursued by these 100 vessels, and this, therefore, is the route for all vessels to take in the month of January; and when we should come to look at the January route thus recommended, we should find, probably, that not one of these 100 vessels had actually sailed, even for one

mile, or for one foot, upon it; that they had crossed this mean path, now in this place, now in that; at one time from this side, and again from that. Under such circumstances, no right-minded mariner would hesitate for a moment about taking this route. But he would not attempt to describe, with the keel of his ship, the line that he had drawn on the chart merely to designate the parts of the ocean through which she was to pass.

Now, this has been actually done with regard to the routes here recommended; they are the mean or average tracks, in some parts of the way, of 700 such vessels in a month; in other parts, only for 20, or whatever be the number of observations that could be procured.

It is true that, in the case of the Charts, I have not actually had 100 such unerring vessels to give me the mean or best average route for each month, but I have had what perhaps was better. I have had the direction of the wind in each district of the ocean given for 100 times and upwards for each month in different years; and when the navigator is told the direction whence the wind comes, he can tell as well what course he could have steered as though he had himself been there, and actually steered it.

I have, therefore, summed up all the winds and calms for each month in every district on the Pilot Chart, and calculated the chances of head winds, and of fair winds, for every point of the compass, through every such district. With these, I then proceed to determine, by mathematical discussion, the mean or average route, which, taking both calms, head winds, and increase of distance into account, should give, on the average, the shortest passage, in time, to the equator.

Of course, then, when a vessel comes to try the new route thus computed, and to project on the Chart the track she actually makes through the water from day to day, it is not to be expected that the track so performed will, when laid down, exactly overlay the one already projected on the Chart as her guide. There will be a general conformity between the two, but nothing like the actual coinciding of two lines.

These remarks are called forth by the fact, that some navigators appear to think that there is some sort of virtue in the black mark on the Chart, which represents any one of these routes—as the April route, for instance; if driven from the April route by head winds, one of these navigators, had he been in the Memnon, at *a* (Plate XI.), would have stood north to get her keel on the black mark for April; and again at *b*, he would have stood to the southward and westward to get upon the April track again.

Now, the Memnon at *a*, or at *b*, was in just as good a position as she would have been had she been "right upon the track." Her very clever master, therefore, did right; he conformed to the Sailing Directions, and was pursuing the route recommended, as closely and as well as though his track had fallen all the way, from *b* down to the equator, upon the line with the arrows, which is projected on the Chart to represent the April route.

The tracks of the vessels projected on Plates XI. and XII., have not been selected on account of their short passages; many other vessels have made passages shorter than these. I have taken them only for the purpose of illustration and demonstration.

In the conformity between the April route of the Chart, and the actual track of the Memnon, in crossing the calms of Cancer, the Charts show a sharp elbow thence to the equator. The Memnon, without

intending to make this elbow, was forced by the winds to make it; and the Sailing Directions indicated that there probably would be an elbow here. The Memnon (Capt. Joseph R. Gordon), crossed the line in 19 days; she had no difficulty in clearing Cape St. Roque, and made a fine passage.

It was the same case with the Surprise (Captain P. Dumaresq); with the Seaman (Captain Joseph Myrick), and with the Dragon (Captain Andrew), and with a host of others whom I am now (1855) able to quote were it desired. The ships mentioned had to the equator 22, 20, and 24 days respectively. And it is remarkable how the tracks of these vessels, and all others that have followed these Sailing Directions, have conformed in their windings and irregularities to the tracks of the Charts.

See the place at which all four of these vessels crossed the parallel of 5° N., to the place where they crossed the line; it is very nearly a direct south course, as represented by the tracks with the arrows, generally for winter and spring; and, as before remarked, the lines which represent the tracks for these months do not represent the tracks which it is possible for one ship in 100 actually to make, but they represent the mean or average track, which 100 ships, sailed by navigators that never were wrong, would make.

Let us now turn to Plate XII., which is an illustration of the summer and fall routes:—

This is the season of the year in which short passages are the most difficult by any route, old or new. Track x is the track of a ship that had the Charts on board. The captain of that ship, judging from the track that he had made, evidently undertook to do what now and then an opinionated navigator is found to do, viz: set up his "own experience" against the experience of the thousand of navigators who had gone before him, all of which is spread out upon the Charts before him.

The track of the brig Acasta is given as an illustration of an attempt often made to "split the difference" between the old and new route.

She sailed from Sag Harbor, September 20, 1850; went as far as 22° W., and crossed the line in long. 26°—November 14—55 days. She got the doldrums in about 11 N., and they stuck by her for 15 days, and until she reached 2° N.

The fragment of the track w, illustrates the case of a vessel that attempted the new route, and abandoned it when she fell in with the equatorial doldrums in 11 N.—September 25, 1850. She was going on very well, but here she met the southerly monsoons which the Charts warned her of at this season of the year. The wind came out S. S. W., and she went on fanning to the eastward and to *leeward.* From this place, it took her 16 days to reach the line.

Such cases as these are common—the errors are generally committed by standing too much towards the old track.

Sometimes, though rarely, vessels make mistakes by going on the other extreme. I find an example of this sort in the case of the U. S. ship Vincennes, Commander Hudson, on a voyage from New York to Rio, in 1849.

Navigators often follow the new route bravely, until they get into the equatorial calms; here their

heart seems to fail them, and they bolt at the very time when they should stick more closely to their guide.

The region which these calms usually include is in the shape of a wedge; it shifts about, but Plates XI. and XII. show its mean place at the four seasons. In each season, it is sometimes above and sometimes below the place assigned it on the Chart. But I have drawn it there to show navigators how they mistake, when being as far west even as 31° or 32°, they fall into these calms, and think of making longitude by fanning along to the eastward or an E. N. E. or perhaps a N. E. course. The further they go on such occasions, the broader grows the belt, and the greater becomes the difficulty of getting across it.

I have projected on Plate XII., by a dotted line, the track of a ship, and marked it *y*, as an illustration of bad management under such circumstances, though it is by no means an extreme case. This ship had 40 days to the line, took the new route, and followed it bravely until she reached the equatorial calms, in longitude 29°. She was then far enough to the eastward, and should not have been afraid to cross the line as far west as 32°. But instead of proceeding to make the best of her way across this belt where it was narrow, and where two or three days at most would have sufficed for crossing it, she proceeded to flap along to the eastward as far as 21°; and thus, in consequence of the monsoons, found herself to *leeward*. When at *h*, that ship should, instead of making about an E. by S. course, have stood on the other tack, making the best of her way south, and not caring to get east of 30°. She might have been content to keep herself between 29°, or 30° and 31° or 32°, while she crossed these calms.

I have not yet found a single case in which there has been, after crossing the line as far as 32°, the least difficulty in clearing St. Roque. Navigators should not hesitate, if they are pinched, to go inside of Fernando de Noronha. But in doing that, they should take care not to run foul of the Rocas, lat. 3° 51 S.; long. 33° 49′ W. These shoals were carefully surveyed by Lt. S. P. Lee, U. S. brig Dolphin. I have the track of one vessel that dashed on, crossed the line in 41° on the 19th day out, and on the 32d day was south of the parallel of Rio. This, though, was in the winter and spring, when vessels can afford to keep to the westward, and it was going further west than I should advise.

But suppose a vessel to cross in 32° or 33°, and to get the S. E. trades at S. E. By standing on S. S. W., she keeps herself in a position in which any change of wind is favorable. If it haul to the eastward, she can lay up and clear the land; if it haul to the southward, she can go about and make easting, and get along rapidly by stretches upon long and short legs.

The current so much dreaded off St. Roque is a good deal of a bugbear. Navigators have been frightened at this current ever since some transports were cast ashore by it, some time in the last century. But it should be borne in mind that it was quite as much of an undertaking for the clumsy transport-built ships of England in the last century, to contend against a current of one knot, as it is now for one of our first-rate clipper-built ships to contend with one of 4 or 5 knots.

The log-book of the Celia, quoted in the 3d edition of this work, is an example. It would have been impossible for that ship to beat against a one-knot current. In the days of this wreck, the passage from England to India averaged nine months. Warren Hastings, when he went out, was 10 months on the way.

The passage is now often made by our ships in less than 3 months. Therefore, the ships of those days might be well cautioned against currents as dangerous, which the ships of the present day would scarcely regard.

Now, my investigations show that there is rarely off Cape St. Roque, and in the fair way from the equator south, either a sweeping or a horsing current. Indeed, many accurate and close observers pass there without reporting any current at all; and though navigators should always be on the lookout for a current there, and should always make allowance for one that is to set them on the land, yet when they do encounter a current there, they may be assured that, as a general rule, it is neither difficult to overcome, nor dangerous on account of its set.

For the guidance of navigators who follow the new route, and are pinched in clearing St. Roque, as they no doubt will occasionally be, I repeat the following suggestions:—

From the line, in longitude 33°, Cape St. Roque bears S. S. W. From this crossing-place, in a smart ship, that will fetch where she looks, a S. E. wind all the way from the line would just prevent the vessel from clearing. But the chances are more than a hundred to one that the wind will not hang steadily at S. E. all the way from the line to St. Roque. If it haul to E. S E. you can lay up and clear. If it haul to S. S. E. you can put about, and make easting.

But suppose the wind holds steadily at S. E. or at any other point which will prevent you from clearing the cape; draw a line from your place on the Chart to the cape, and avoid falling to the west of that line, by taking advantage of slants, or by beating, accordingly as you may have the wind, and making long and short stretches. I quote the case of the Stag Hound as an example.

Captain Richardson to Lieutenant M. F. Maury.

"SAN FRANCISCO, *June* 12, 1851.

"Herewith I send you abstract of ship Stag Hound's passage from New York to San Francisco, stopping at Valparaiso. Our passage from New York to Valparaiso was sixty-six days; from Valparaiso to San Francisco was forty-two days—nearly all the way light trades: S. E. and N. E.

"Six days out from New York, broke off main topmast, and that in its fall took all three topgallant masts. Soon after took a W. S. W. and west gale—run the ship dead before the sea and wind; in consequence of this, crossed the equator in about longitude 28° 30′ W. in twenty-one days from New York. Losing topmast, we had no main topsail in the ship for nine days, and no topgallant sails for twelve days; had we not met with this accident, I think we should have been down to the line in sixteen days.

"In latitude 4° N. the N. E. trades left us, then baffling down to latitude 2° N. Then took the wind at S. S. E. and S. E. until near the coast of Brazil, when the wind hauled, so we did not have to make a tack; presume, had we crossed in longitude 30° W., we should have fetched along the coast."

This letter of Captain Richardson is quoted as an illustration of what I have endeavored to impress upon navigators, with regard to their course, after crossing the line well to the westward, and when it

appears to be touch and go, as to clearing St. Roque, viz: stand boldly on, and take advantage of slants and short legs to make long ones.

I received the abstract of another vessel about the same time that crossed in 31°, and I notice in the remarks, after crossing the line—"back-strapped"—"no chance of weathering Cape St. Roque"—"shall evidently fall to leeward," "bad luck," &c. Yet this desponding navigator stood boldly on, took advantage of a slant, stood off for eight hours, went past St. Roque like a shot, and the thirty-second day out from New York crossed the parallel of Rio.

Mistakes in the route to Rio are, I am happy to say, becoming much less frequent. The Charts are evidently much better understood now than they were formerly. Since the last edition of these Sailing Directions went to press, no such mistake as that of the Vincennes has come to my knowledge.

With a view of contrasting the passages of the new route, Lieutenant Minor has, at my request, taken the logs of all the vessels that have come to hand between the publication of the fourth edition, and the going to press with the seventh edition of this work, and from them tabulated the passages to the equator, and thence to clearing Cape St. Roque.

The old route is nearly broken up. It is now rarely attempted. But occasionally vessels evidently aim to "split the difference" between the *old route* and the *new*, by steering a sort of middle course between them. This I have called the MIDDLE ROUTE.

Many of the vessels which take this middle route, evidently set out with the intention of trying the new route, but they get a little pinched; or the winds are too favorable; or the dread of that bugbear off Cape St. Roque—a westwardly current—seizes them; or, through fear of falling to leeward, of getting back-strapped, &c., they go too far east and get delayed in the doldrums.

New Route Crossings.—January.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Diadem	N. York, 1st	37°00′	28°00′	29°00′	28°00′	27°00′	27°00′	29°00′	38	42
Black Squall (barque)	Baltimore, 8th	40 00	39 00	38 00	36 00	36 00	30 00	27 16	24	27
Great Britain . . .	N. York, 9th	36 00	37 00	36 00	35 00	33 00	29 00	30 00	27	30
Miantonomi (barque) .	" 8th	45 00	44 00	44 00	41 00	40 00	38 00	30 23	39	43
A. Cheseborough . .	" 12th	47 50	44 00	41 00	37 30	35 00	30 15	31 20	29	32
Amelia	" 8th	39 00	36 00	34 30	33 30	31 30	28 30	30 40	29	31
Rattler	" 8th	37 45	41 00	39 30	38 00	36 00	33 00	31 50	25	27
Eagle*	" 7th	33 25	34 30	32 58	31 50	30 30	29 30	29 00	24	27
Tornado	" 11th	46 00	38 45	36 30	33 50	31 30	30 00	30 06	22	24
Celestial	" 8th	45 30	38 30	38 00	35 30	32 00	29 00	27 52	23	26
Esther May	Boston, 6th	36 30	39 45	38 00	36 00	32 40	30 20	30 20	28	31
Lucknow	" 15th	42 00	40 00	36 30	34 00	31 45	28 15	30 40	22	25
Golden Rover . . .	" 30th	37 00	35 15	30 45	30 45	30 30	29 00	29 55	33	35
Phantom (barque) . .	" 6th	37 00	41 30	42 00	41 50	38 30	34 00	32 40	25	27
Susquehanna . . .	Philad., 12th	41 40	39 00	36 40	33 36	31 30	29 00	28 00	30	34
Phantom (barque) . .	Baltim'e, 31st	44 00	44 50	39 00	34 20	34 30	31 20	29 45	31	34
Alert	N. York, 17th	38 00	40 00	42 00	40 00	38 00	32 00	32 06	34	38
Hudson Trask . . .	C. Henry, 1st	49 00	46 00	46 00	43 00	40 00	37 00	35 04	26	28
Flying Cloud . . .	N. York, 22d	48 00	47 00	45 00	43 00	39 00	33 00	31 15	17	20
Game Cock	" 1st	39 00	37 00	36 00	35 00	33 00	31 00	30 50	22	25
Culloma	" 8th	44 00	41 00	39 00	36 00	33 00	30 00	28 17	38	42
Huguenot	" 6th	34 00	35 00	34 00	34 00	32 00	30 00	30 14	27	29
Maria	" 21st	53 00	44 00	44 00	41 00	40 00	35 00	30 50	33	36
Windward	Baltim'e, 13th	53 00	43 00	39 00	37 00	32 00	29 00	29 34	37	40
Herald of the Morning	Boston, 21st	32 00	31 00	31 00	31 00	30 00	29 00	30 00	23	26
Archer	N. York, 13th	43 00	43 00	41 00	39 00	37 00	35 00	30 59	20	23
Z. D.	" 15th	45 00	41 00	38 00	36 00	33 00	31 00	30 11	28	31
Seaman's Bride . . .	" 24th	39 00	39 00	38 00	34 00	31 00	30 00	28 44	27	30
Pontiac	Boston, 20th	46 00	38 00	34 00	33 00	31 00	29 00	29 40	46	49
M. Howes	" 14th	44 00	39 00	38 00	36 00	32 00	29 00	29 00	27	30
Tsar	" 12th	44 00	32 00	38 00	34 00	31 00	28 00	27 30	30	33
Means		41 49	40 13	37 56	35 55	33 41	30 47	30 06	28.8	31.4
Means of the best six		41 40	39 30	37 30	36 00	33 40	31 00	30 38	21	24

* She attempted to split the difference.

New Route Crossings—Continued. FEBRUARY.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF— 30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	CROSSED EQUATOR. Long. W.	Days.	PASSED ST. ROQUE. Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Kate Hays	N. York, 3d	49°00′	42°00′	38°00′	34°00′	30°00′	29°00′	28°40′	29	33
Isabelita Hyne (barque)	" 5th	55 30	53 00	51 00	49 00	45 00	38 00	33 20	22	25
Wallace (barque) . .	Boston, 6th	44 00	43 00	39 00	35 00	31 00	29 00	29 25	38	43
Francis	N. York, 12th	53 00	39 00	39 00	38 00	34 00	30 00	29 00	38	43
Eastern State . . .	" 13th	39 00	36 00	33 00	30 00	30 00	29 00	29 30	24	27
Sacramento (brig) . .	" 21st	42 00	40 00	39 00	36 00	31 00	26 00	27 00	30	33
Maria	" 21st	47 00	41 00	38 00	34 00	31 00	29 00	29 00	21	24
Ariel	" 24th	38 00	34 00	32 00	30 00	29 00	28 00	27 20	32	35
Tornado	" 23d	47 00	40 00	38 00	35 00	32 00	30 00	28 48	28	31
New York	" 20th	45 30	43 10	40 00	35 30	31 45	28 45	28 30	24	28
Sea Serpent	" 12th	50 30	43 49	39 45	36 45	33 45	30 45	30 20	20	22
Archer	" 20th	45 45	46 45	44 45	40 30	35 30	30 30	29 00	27	30
Stag Hound	" 24th	34 35	34 30	34 00	33 30	31 45	30 15	29 30	22	24
Swordfish	" 12th	39 00	37 00	36 00	34 10	32 30	30 15	29 08	23	26
Honqua	" 22d	44 10	43 00	39 50	35 27	32 30	30 15	29 10	27	30
Gov. Morton	" 8th	44 10	39 45	33 45	32 05	31 00	29 50	30 50	25	28
Paragon	" 8th	44 30	34 35	31 00	29 20	28 00	26 50	27 50	28	31
Sirocco	" 16th	39 45	35 15	33 10	31 10	28 45	28 20	28 05	25	32
Herculean	" 9th	44 00	37 45	35 30	33 20	31 30	29 00	28 00	27	31
Hampton	" 18th	37 40	36 45	34 00	31 00	29 20	29 00	29 30	32	36
Morgan Dix (barque) .	Boston, 26th	43 00	38 51	36 45	34 45	32 20	30 00	31 10	24	28
Golden Rover . . .	" 8th	37 00	35 15	30 45	31 00	30 45	29 00	29 55	25	27
Robt. Harding . . .	" 23d	36 45	35 00	32 50	30 40	29 00	28 40	28 30	27	30
Marion	Philad., 4th	48 30	37 20	30 50	29 45	29 45	29 50	30 40	31	34
Petrel	" 24th	37 40	34 45	32 00	30 15	30 30	29 00	29 30	26	29
Hugh Birckhead . .	Baltim'e, 26th	45 50	41 45	40 45	35 30	31 40	30 30	29 37	23	26
Sartelle	C. Henry, 25th	41 00	40 00	37 00	34 00	31 00	30 00	29 00	28	35
Ariel	N. York, 9th	42 00	36 00	31 00	30 00	29 00	29 00	30 00	28	30
C. L. Bevan	Philad., 9th	48 00	35 00	34 00	33 00	33 00	31 00	28 59	28	30
Catherine	N. York, 27th	51 00	44 00	39 00	32 00	29 00	26 00	26 00	32	37
Empress*	" 23d	25 00	20 00	21 00	24 00	20 00	19 00	19 19	46	48
Jas. H. Shepherd . .	" 7th	34 00	33 00	33 00	32 00	30 00	30 00	29 55	32	39
Eliza Thornton . . .	N. Bedf'd, 13th	50 00	46 00	42 00	41 00	39 00	32 00	29 20	29	34
St. Lawrence	N. York, 9th	31 00	30 00	28 00	28 00	28 00	28 00	28 00	34	38
Hampton	" 19th	38 00	37 00	34 00	31 00	30 00	29 00	29 20	31	34
Roscoe	" 27th	48 00	34 00	32 00	31 00	30 00	29 00	28 00	33	35
Wm. Price	Philad., 20th	42 00	37 00	34 00	31 00	28 00	27 00	26 20	31	35
Dodge	Boston, 12th	46 00	39 00	38 00	35 00	33 00	31 00	31 30	26	29
Mary MacRae . . .	Wil., N.C. 28th	50 00	42 00	40 00	38 00	34 00	30 00	28 03	34	41
Weybosset	N. York, 23d	38 00	36 00	34 00	32 00	29 00	27 00	26 00	32	36
Polynesian	Philad., 2d	50 00	41 00	34 00	34 00	32 00	31 00	31 37	28	32
Cynthia	N. Orleans, 1st	44 00	37 00	38 00	36 00	32 00	30 00	30 02	33	36
Daniel Webster . . .	N. York, 12th	41 00	39 00	38 00	36 00	32 00	29 00	28 00	28	34
Vernon	" 11th	42 00	39 00	37 00	34 00	32 00	29 00	29 54	31	35
Gleaner	" 24th	38 00	38 00	37 00	33 00	30 00	28 00	27 15	32	36
Means		43 20	36 30	36 10	33 45	31 13	29 26	29 17	28.4	32.1
Means of the best six		44 16	40 53	38 37	36 14	34 00	31 12	30 08	22.0	24.7

* Old route; not included in the mean crossings.

New Route Crossings—Continued. MARCH.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Stag Hound	N. York, 1st	40°00′	32°00′	32°00′	27°00′	27°00′	28°00′	28°00′	26	29
Michael Angelo . . .	" 6th	48 00	38 00	33 00	30 00	28 00	25 00	23 30	26	32
Sarah Boyd	Philad., 9th	42 30	37 00	34 00	32 00	31 00	29 00	28 00	32	38
Sea Serpent	N. York, 10th	47 00	41 00	39 00	35 00	32 00	31 00	29 30	18	23
Parana	" 16th	36 00	31 00	30 00	29 00	28 00	28 00	28 15	24	26
Gov. Morton	" 12th	43 00	38 00	35 00	33 00	30 00	29 00	28 00	26	31
Candace (barque) . .	" 25th	45 00	43 00	42 00	41 00	38 00	32 00	30 10	30	32
Kedar (barque) . . .	Boston, 27th	39 00	32 00	30 00	29 00	29 00	29 00	29 30	40	44
Golden Era (barque) .	N. York, 25th	40 00	38 00	38 20	34 45	31 30	28 30	26 20	38	41
Surprise	" 13th	49 00	43 10	41 50	40 00	36 22	32 00	30 00	20	22
Empress of the Seas .	" 13th	48 00	42 00	40 00	38 00	35 30	31 30	30 10	24	28
Seaman's Bride . . .	" 19th	44 00	37 20	36 40	34 30	32 10	29 45	29 05	23	25
Lantao	" 21st	43 00	40 00	39 00	36 30	32 45	30 00	29 45	24	27
R. C. Winthrop . . .	Boston, 27th	40 02	35 00	33 30	31 30	30 43	29 07	27 30	26	31
Horsburgh	" 25th	46 30	40 40	38 30	36 00	33 30	29 45	29 20	24	27
Competitor	" 27th	36 08	33 00	32 00	31 40	30 00	28 20	28 45	24	27
Climax	" 28th	43 00	41 00	38 40	36 10	32 00	29 00	29 20	20	25
Parthian	Richm'd, 23d	43 30	37 00	35 00	33 00	31 10	29 30	29 40	22	26
Storm King	Boston, 14th	40 00	37 00	37 00	36 00	34 00	30 00	30 00	23	26
Santiago	N. York, 15th	46 00	36 00	36 00	34 00	31 00	28 00	28 05	27	29
Rosario*	" 6th	35 00	27 00	27 00	27 00	27 00	26 00	27 16	28	31
B. Howard	" 13th	46 00	41 00	40 00	38 00	33 00	29 00	27 54	28	31
Mary Annah	" 21st	47 00	37 00	34 00	32 00	30 00	29 00	26 56	31	34
L. P. Foster	Boston, 29th	39 00	37 00	35 00	33 00	31 00	29 00	30 06	26	29
Yarmouth	N. York, 27th	43 00	41 00	40 00	38 00	36 00	32 00	31 56	36	40
Matanzas	Boston, 1st	45 00	40 00	36 00	34 00	32 00	30 00	30 04	31	35
Vandalia*	Baltim'e, 9th	31 00	30 00	29 00	29 00	27 00	25 00	24 36	45	48
R. B. Forbes	N. York, 11th	30 00	29 00	29 00	29 00	29 00	28 00	28 12	28	31
Chanticleer	Baltim'e, 1st	44 00	39 00	39 00	34 00	31 00	27 00	26 30	29	32
Relief, U. S. S. . . .	N. York, 24th	38 00	36 00	33 00	31 00	29 00	27 00	26 30	29	32
Means		41 55	37 08	35 26	33 26	31 20	28 58	28 22	27.9	31
Means of the best six		44 20	39 20	37 50	35 40	32 50	30 29	29 36	21	24.5

* Old route.

New Route Crossings—Continued. APRIL.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Empire	N. York, 2d	40°00′	34°00′	35°00′	35°00′	32°00′	29°00′	28°40′	26	30
Thos. B. Wales . . .	Boston, 7th	42 00	39 00	34 00	33 00	30 00	29 00	28 00	26	30
White Squall . . .	N. York, 10th	38 00	34 00	32 00	31 00	29 00	28 00	27 00	21	24
Nestorian	" 24th	36 00	34 00	35 00	33 00	30 00	27 00	29 32	31	35
Huma (barque)* . .	" 25th	59 00	54 00	51 00	46 00	43 00	39 00	37 10	40	48
Hazard (barque) . .	Boston, 27th	39 30	38 00	37 00	34 00	31 00	28 00	28 30	25	27
North American . .	N. York, 3d	54 00	42 00	36 00	34 00	35 00	30 00	27 00	26	30
Southerner (barque) .	" 22d	41 20	40 30	41 00	39 30	36 30	32 00	29 40	27	32
Swan (barque) . . .	Richm'd, 12th	38 10	36 30	34 45	33 00	30 45	29 00	30 45	25	27
Mayflower	N. York, 19th	34 00	30 00	30 00	30 00	29 00	28 31	31 00	30	32
Gem of the Sea . . .	" 19th	40 00	33 00	33 00	32 00	32 00	31 00	32 28	29	31
Channing	" 17th	37 00	36 00	34 00	33 00	30 00	28 00	29 50	32	35
Oxnard	" 16th	37 00	33 00	33 00	32 00	31 00	29 00	29 30	32	35
Amazon	" 7th	37 00	35 00	32 00	31 00	29 00	28 00	29 06	32	35
Levanter*	" 24th	44 00	43 00	43 00	42 00	39 00	36 00	35 28	26	45
Linwood	Baltim'e, 15th	52 00	34 00	32 00	32 00	29 00	28 00	29 51	33	36
Hornet	N. York, 28th	43 00	40 00	40 00	38 00	36 00	31 00	31 45	18	21
American	" 5th	38 00	37 00	34 00	32 00	30 00	29 00	30 34	40	43
Pilot	Salem, 25th	31 00	31 00	31 00	31 00	30 00	29 00	30 35	27	30
Atalanta	N. York, 28th	46 00	44 00	42 00	39 00	35 00	31 00	31 30	35	38
Corrinne	" 29th	52 00	51 00	47 00	44 00	42 00	37 00	30 22	47	51
E. C. Sronton . . .	" 28th	45 00	43 00	39 00	37 00	33 29	29 00	29 15	38	42
W. S. Lewis	Boston, 19th	34 00	30 00	30 00	30 00	30 00	29 00	31 30	27	30
Sophronia†	" 16th	30 00	28 00	28 00	29 00	28 00	28 00	30 27	34	37
Bay State	N. York, 13th	40 00	38 00	36 00	33 00	30 00	29 00	30 06	31	34
Mazatlan	" 6th	37 00	36 00	34 00	32 00	30 00	28 00	29 40	33	36
Cleopatra†	Boston, 23d	30 00	28 00	28 00	28 00	28 00	28 00	31 33	24	27
Celestial Empire . .	N. York, 28th	42 00	39 00	36 00	33 00	30 00	29 00	32 03	27	30
Sarah Boyd	" 29th	38 00	38 00	37 00	35 00	32 00	28 00	30 00	41	44
Surprise	" 6th	40 00	35 00	33 00	31 00	30 00	30 00	29 30	19	21
Means		43 19	38 17	35 04	33 40	31 19	29 20	30 12	29.7	33.4
Means of the best six		38 07	35 15′	34 07	32 30	30 47	29 00	29 50	22	24.6

* Back-strapped.

† Old route.

New Route Crossings—Continued. MAY.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Staffordshire	Boston, 3d	52°00′	50°00′	45°00′	42°00′	37°00′	32°00′	29°40′	25	28
Robert Wing (brig) .	" 6th	41 00	39 00	35 00	33 00	31 00	28 00	29 55	31	34
Equator	" 9th	43 00	39 00	38 00	38 00	36 00	33 00	31 02	43	46
F. Copeland (brig) . .	" 11th	43 30	39 00	36 00	34 00	32 00	29 00	32 00	37	40
Carioca	Philad., 13th	43 00	39 00	37 00	35 00	32 00	27 00	32 00	35	40
Sea Breeze	Boston, 15th	44 00	40 00	40 00	39 00	37 00	32 00	30 00	35	38
Isabelita Hyne (barque)	N. York, 21st	40 00	36 00	35 00	32 00	30 00	29 00	30 34	25	28
Albany	" 24th	39 00	37 00	35 00	33 00	30 00	27 00	27 30	42	45
Flying Cloud . . .	" 14th	42 50	37 30	35 20	34 00	32 30	31 30	33 41	29	31
N. B. Palmer . . .	" 2d	40 45	33 10	32 00	30 15	27 30	25 30	28 50	24	26
Eliza Mallory . . .	" 18th	41 00	37 20	34 45	32 20	30 00	27 30	31 00	32	36
Ottawa (barque) . .	" 6th	45 20	45 00	43 00	40 20	35 00	32 15	33 00	35	37
Audubon	Boston, 8th	42 30	39 50	38 00	36 00	33 43	32 00	31 53	24	28
Mary Maukin (sch'r)* .	G. Town, 13th	33 00	32 10	32 30	31 00	29 15	28 15	30 15	32	36
Judge Shaw	Boston, 20th	36 00	36 00	35 00	34 00	32 00	30 00	31 41	33	36
Union*	" 15th	33 00	31 00	30 00	29 00	26 00	24 00	26 21	34	36
St. Andrew*	Philad., 1st	38 00	36 00	31 00	28 00	25 00	21 00	24 10	45	47
Oceanus	Boston, 2d	42 00	39 00	37 00	35 00	32 00	28 00	29 04	52	55
White Squall . . .	Philad., 10th	41 00	41 00	40 00	39 00	35 00	29 00	31 37	27	29
Golden State† . . .	N. York, 26th	49 00	43 00	43 00	43 00	39 00	36 00	36 38	24	31
Probus*	" 25th	34 00	32 00	30 00	29 00	28 00	26 00	30 00	54	57
Union	" 19th	38 00	36 00	34 00	32 00	31 00	29 00	24 37	44	47
Greenwich	Boston, 9th	43 00	42 00	40 00	40 00	36 00	27 00	30 35	36	39
White Swallow . . .	" 28th	38 00	35 00	34 00	33 00	30 00	28 00	32 27	49	54
Pelican State . . .	Philad., 16th	40 00	39 00	37 00	32 00	30 00	28 00	29 28	39	42
Rubicon*	N. York, 15th	30 00	28 00	28 00	26 00	24 00	17 00	20 48	42	45
Harrisburg*	" 10th	33 00	31 00	29 00	29 00	28 00	27 00	29 35	43	46
Belle of the West . .	Boston, 21st	45 00	46 00	47 00	44 00	41 00	37 00	35 45	34	37
Anglo Saxon . . .	N. York, 15th	33 00	31 00	31 00	31 00	30 00	29 00	30 10	29	33
F. P. Sage*	" 27th	36 00	33 00	32 00	31 00	29 00	28 00	31 36	52	55
Ino	" 11th	43 00	42 00	40 00	37 00	33 00	30 00	30 35	29	31
Marion	Philad., 11th	32 00	31 00	30 00	30 00	30 00	29 00	31 38	34	37
Texas	N. York, 11th	32 00	31 00	30 00	30 00	30 00	29 00	31 45	34	37
Nimrod†	" 1st	50 00	48 00	49 00	48 00	48 00	43 00	30 56	43	47
West Wind	Boston, 15th	42 00	43 00	41 00	38 00	34 00	28 00	30 18	25	28
Cyane	H. Roads, 18th	38 00	37 00	36 00	33 00	31 00	29 00	32 00	26	29
Sandusky	N. York, 21st	38 00	37 00	36 00	33 00	30 00	29 00	32 13	43	46
Avondale	Baltimore, 3d	38 00	36 00	35 00	33 00	31 00	29 00	28 52	33	35
Reindeer	N. York, 19th	40 00	40 00	39 00	36 00	32 00	30 00	29 58	30	33
Rockland*	" 22d	29 00	28 00	28 00	27 00	27 00	28 00	30 15	35	38
Nestorian*	" 28th	33 00	30 00	29 00	29 00	26 00	19 00	25 40	53	56
Hersilia	Boston, 1st	53 00	45 00	43 00	36 00	32 00	29 00	29 09	51	54
Means		40 51	39 10	37 18	35 15	32 46	29 56	30 53	34.2	37.6
Means of the best six		44 10	40 50	39 00	36 50	33 40	30 30	31 19	24.5	28.1

* Not included in the mean crossings, because they did not follow the new route.

† Back-strapped.

New Route Crossings—Continued. JUNE.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Union	N. York, 2d	43°00′	42°00′	40°00′	39°00′	37°00′	27°00′	30°20′	24	26
Flying Cloud . . .	" 3d	40 00	40 00	40 00	38 00	36 00	32 00	33 00	22	24
Russell (brig) . . .	Salem, 6th	35 00	33 00	32 00	29 00	27 00	23 00	28 00	32	35
Cohota	Boston, 17th	48 00	43 00	40 00	37 00	31 00	25 00	26 00	32	34
Valparaiso	N. York, 18th	35 30	35 00	35 00	32 00	31 00	27 00	31 41	34	37
Witch of the Wave .	Boston, 23d	51 00	50 00	49 00	47 00	44 00	38 00	33 25	27	32
Defiance	N. York, 26th	44 00	46 00	45 00	43 00	39 00	27 00	31 00	36	38
Miantonomi (barque) .	" 28th	45 00	43 00	41 00	40 00	36 00	26 00	32 13	36	40
Helena*	" 10th	34 40	33 30	33 20	32 15	31 20	29 10	31 50	25	29
Messenger	" 1st	43 30	41 42	39 30	38 00	33 20	27 00	31 54	24	26
Tarolinta	" 11th	39 00	36 00	34 00	34 00	31 00	28 00	31 49	36	40
Hero	" 21st	49 00	44 00	41 00	38 00	34 00	25 00	29 25	42	44
Greyhound	Richm'd, 24th	43 00	41 00	39 00	35 00	31 00	30 00	32 29	36	39
Chilo	Boston, 25th	44 00	43 00	40 00	36 00	32 00	27 00	33 00	29	32
Joseph Maxwell . .	N. York, 16th	40 00	36 00	36 00	32 00	30 00	26 00	30 45	32	34
Reindeer	Baltim'e, 21st	48 00	46 00	45 00	40 00	35 00	26 00	30 00	29	31
Albany	N. York, 2d	47 00	43 00	40 00	36 00	30 00	27 00	31 05	48	51
Flying Dutchman . .	" 22d	51 00	46 00	41 00	38 00	33 00	29 00	31 34	27	30
Young America . .	" 11th	58 00	46 00	44 00	41 00	38 00	36 00	32 02	35	37
Horsburgh*	" 1st	35 00	32 00	31 00	31 00	30 00	24 00	28 00	47	50
Wild Ranger . . .	Boston, 22d	49 00	46 00	44 00	42 00	38 00	30 00	32 24	28	31
Kate Hays	Philad., 3d	34 00	34 00	34 00	33 00	30 00	31 00	30 56	43	46
Winfield Scott . . .	N. York, 12th	46 00	42 00	40 00	38 00	34 00	26 00	31 04	38	41
Windward	" 1st	34 00	32 00	31 00	31 00	30 00	31 00	31 17	44	50
Messenger	Philad., 4th	38 00	37 00	36 00	32 00	28 00	26 00	28 00	30	33
Kanawha	Savan., 25th	50 00	48 00	46 00	44 00	37 00	30 00	30 40	55	59
Arethusa	Portland, 26th	43 00	41 00	37 00	33 00	31 00	27 00	31 45	38	41
Grey Eagle	C. H., 8th	43 00	43 00	42 00	39 00	34 00	30 00	34 00	28	31
Inez*	Boston, 3d	35 00	33 00	31 00	29 00	26 00	21 00	24 34	48	50
Sunbeam	" 17th	45 00	38 00	36 00	34 00	30 00	26 00	30 56	39	41
Minnetonka	N. York, 12th	43 00	39 00	37 00	36 00	32 00	28 00	30 40	36	40
Means		43 33	40 16	39 12	37 35	33 12	28 16	31 08	33.9	37.4
Means of the best six		43 50	42 20	40 20	38 40	35 50	30 20	32 00	24.8	27.8

* Old route; not included in the mean crossings.

New Route Crossings—Continued. JULY.

NAME OF VESSEL.	SAILED FROM.		LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
			30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
			Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Mermaid (barque)	N. York,	2d	52°00′	52°00′	50°00′	46°00′	43°00′	30°00′	34°00′	33	37
Telegraph	"	13th	50 00	48 00	46 00	43 00	39 00	26 30	29 00	33	35
Horatio	"	15th	39 00	36 10	34 30	33 30	32 10	29 48	30 55	33	36
Hazard (barque)	"	16th	36 05	34 30	34 30	34 00	33 20	31 30	34 00	32	36
Wild Pigeon	"	11th	48 30	38 00	36 20	35 30	32 50	30 30	33 30	33	37
John Gilpin	"	28th	35 50	34 10	33 30	32 50	31 15	29 40	31 00	25	27
Robert Wing (brig)	"	29th	49 20	45 30	44 20	39 30	37 50	35 00	35 40	33	37
Georgiana (brig)	"	26th	46 00	40 00	30 30	30 00	28 45	27 30	29 50	31	34
Parana	"	2d	44 00	44 45	44 16	39 45	38 10	35 25	34 45	38	42
Capitol	Richm'd,	18th	44 00	37 30	35 00	33 08	31 00	29 00	30 15	30	33
Aura	N. York,	11th	37 00	35 00	32 00	31 00	29 00	27 00	30 50	40	43
Wizard	"	24th	46 00	43 00	41 00	38 00	33 00	30 00	30 15	24	26
Arab*	Boston,	7th	45 00	41 00	38 00	34 00	29 00	19 00	26 08	33	36
Wisconsin*	N. York,	7th	42 00	39 00	37 00	33 00	28 00	22 00	27 50	35	37
Relief, U. S. S.	"	26th	47 00	43 00	42 00	39 00	36 00	24 00	28 06	40	43
North Wind	"	29th	48 00	47 00	44 00	42 00	35 00	29 00	29 58	33	35
Pride of the Sea	"	7th	47 00	44 00	40 00	37 00	34 00	30 00	33 26	26	30
Wild Duck	"	5th	48 00	46 00	44 00	42 00	36 00	28 00	31 01	31	33
Manlius	Boston,	17th	48 00	43 00	39 00	35 00	32 00	29 00	31 45	39	42
John Bertram	"	1st	49 00	50 00	48 00	45 00	42 00	32 00	31 46	31	34
Queen of Clippers	N. York,	1st	52 00	51 00	50 00	47 00	43 00	31 00	33 43	33	35
Whistler	Boston,	16th	49 00	47 00	46 00	43 00	35 00	27 00	32 07	32	35
Weybosset*	"	1st	44 00	41 00	38 00	34 00	29 00	27 00	31 30	41	44
Boston*	N. York,	4th	42 00	39 00	36 00	32 00	29 00	21 00	28 30	36	39
Audubon*	"	3d	39 00	38 00	37 00	34 00	32 00	26 00	28 31	33	35
Kremlin	Boston,	8th	47 00	45 00	43 00	41 00	31 00	30 00	30 00	34	37
Agnes Leeds	N. York,	23d	42 00	40 00	38 00	34 00	31 00	28 00	32 15	30	33
Means			45 03	42 18	39 58	37 15	34 03	28 18	31 06	33	36
Means of the best six			44 00	41 30	39 00	36 40	33 40	29 50	31 29	27.7	30.7

* Too far to the eastward.

New Route Crossings—Continued. AUGUST.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Raven*	N. York, 1st	34°00′	34°00′	34°00′	34°00′	33°00′	26°00′	31°00′	33	35
Sea Witch	" 2d	47 00	45 00	41 00	28 00	35 00	26 00	27 00	28	30
Typhoon	" 3d	47 00	46 00	45 00	42 00	35 00	26 00	29 00	28	30
Seaman	" 3d	40 00	39 00	38 00	36 00	35 00	27 00	31 51	29	31
Winged Arrow . . .	Boston, 5th	47 00	46 00	45 00	43 00	39 00	30 00	31 00	28	30
Raven†	" 6th	44 00	41 00	39 00	37 00	33 00	25 30	28 00	25	27
Cohota†	" 11th	44 00	41 00	39 00	36 00	29 00	28 00	24 00	29	32
Sovereign of the Seas	N. York, 14th	34 00	34 40	34 50	33 45	33 00	27 10	36 00	25	28
Sea Witch	" 23d	41 00	37 00	36 00	34 00	30 00	25 00	27 00	29	31
Oliver J. Hays . . .	" 29th	43 30	41 00	39 00	35 00	34 00	30 00	28 00	51	54
Seaman	" 3d	40 00	39 00	38 00	36 00	35 00	27 00	31 51	29	31
Edwin*	Boston, 26th	47 00	44 00	42 00	35 00	28 00	23 00	24 00	54	57
Gertrude	N. York, 3d	36 00	35 00	33 00	31 00	28 00	24 00	31 33	32	35
Antelope	Baltim'e, 15th	52 00	45 00	42 00	41 00	35 00	27 00	26 47	38	41
Manchester*	N. York, 19th	42 00	35 00	30 00	27 00	25 00	19 00	18 34	55	58
John Wade	Boston, 25th	43 00	40 00	39 00	37 00	33 00	30 00	32 46	31	33
Onward	N. York, 28th	43 00	41 00	38 00	37 00	34 00	30 00	30 50	45	47
Witch of the Wave .	Boston, 16th	33 00	33 00	32 00	31 00	30 00	27 00	33 34	29	32
Raven	N. York, 14th	47 00	47 00	46 00	44 00	38 00	30 00	29 46	26	28
Nazarene	" 13th	38 00	36 00	33 00	33 00	29 00	28 00	29 24	44	47
Samuel Train . . .	" 5th	52 00	43 00	40 00	38 00	34 00	27 00	29 56	49	52
Emily*	Philad., 27th	37 00	34 00	32 00	31 00	29 00	25 00	30 04	52	54
Thos. W. Sears . . .	N. York, 20th	43 00	39 00	36 00	34 00	31 00	23 00	28 44	42	45
Monsoon	Boston, 29th	53 00	47 00	42 00	39 00	34 00	25 00	32 25	34	37
Raritan, U. S. F.* . .	Norfolk, 24th	19 00	22 00	24 00	27 00	24 00	21 00	24 50	55	58
Comet	N. York, 5th	46 00	43 00	41 00	39 00	36 00	28 00	30 00	28	30
Trade Wind	Philad., 7th	51 00	43 00	41 00	39 00	35 00	24 00	26 37	32	34
Mandarin	N. York, 11th	47 00	46 00	44 00	43 00	39 00	28 00	32 30	28	31
Hurricane	" 9th	49 00	45 00	44 00	43 00	41 00	32 00	29 58	25	27
Maine Law	" 10th	49 00	44 00	42 00	40 00	35 00	27 00	29 45	34	36
Sheffield†	" 17th	45 00	41 00	41 00	39 00	36 00	36 00	34 34	55	61
Sea Witch	" 10th	49 00	45 00	41 00	37 00	34 00	24 00	22 42	30	32
Agnes	" 9th	48 00	45 00	42 00	40 00	36 00	29 00	28 00	25	28
Auckland	Boston, 16th	39 00	40 00	39 00	38 00	35 00	27 00	30 42	33	36
Helena	N. York, 15th	38 00	36 00	33 00	33 00	30 00	26 00	31 05	34	36
Oriental*	Boston, 13th	39 00	38 00	37 00	36 00	35 00	20 00	20 25	55	58
Sylvina	" 2d	49 00	44 00	43 00	41 00	33 00	28 00	31 21	46	49
Chenango*	Baltim'e, 22d	47 00	44 00	42 00	38 00	35 00	26 00	25 39	58	61
Means		44 25	41 21	39 25	37 02	33 54	27 28	29 46	32.9	35.7
Means of the best six		44 50	43 00	41 30	40 00	36 40	28 40	30 43	25.4	28.3

* Not included in the mean crossings, because they went the old route, or undertook to "split the difference."

† Back-strapped; not included in the mean crossings.

New Route Crossings—Continued. SEPTEMBER.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Senator	N. York, 12th	39°00′	36°30′	34°30′	33°45′	30°30′	26°30′	29°00′	38	41
Realm	" 23d	42 00	32 30	32 00	31 20	31 00	28 10	30 45	43	45
John Wade	" 12th	40 25	37 30	35 00	34 51	32 00	28 00	29 00	32	34
Annie Buckman . .	" 26th	40 00	33 00	31 20	30 29	29 30	28 30	31 30	36	38
Revere	Boston, 15th	40 00	37 45	35 00	33 30	31 30	27 50	32 30	35	39
Eolus (barque) . . .	" 28th	37 30	34 45	32 15	31 00	28 45	27 15	30 20	38	40
Anstiss	Richm'd, 28th	57 00	47 50	40 20	37 45	34 00	26 00	29 00	45	48
A. F. Jenness* . . .	Philad., 27th	40 45	39 20	38 30	37 30	36 00	27 30	30 30	77	80
Ann Maria*	N. York, 11th	30 00	29 00	28 00	27 00	24 00	22 00	26 50	44	46
Morning Light . . .	Philad., 26th	31 00	30 00	30 00	30 00	29 00	29 00	33 01	38	40
Magnolia	Boston, 21st	45 00	44 00	42 00	39 00	37 00	32 00	29 20	41	43
Lady Arbella . . .	N. York, 30th	41 00	38 00	38 00	36 00	33 00	30 00	28 04	44	47
Tonia*	C. Canso, 1st	40 00	39 00	37 00	34 00	26 00	22 00	26 10	40	42
Unknown	Boston, 20th	35 00	36 00	35 00	34 00	32 00	27 00	31 29	25	27
Franconia	" 19th	42 00	36 00	34 00	33 00	32 00	29 00	30 21	47	50
Winged Arrow . . .	" 11th	50 00	49 00	47 00	46 00	44 00	40 00	30 40	37	39
Skylark	N. York, 20th	38 00	38 00	38 00	37 00	36 00	31 00	32 53	29	31
N. B. Palmer . . .	" 28th	40 00	38 00	37 00	35 00	33 00	27 00	28 33	31	34
Medford*	Boston, 19th	35 00	30 00	29 00	28 00	26 00	21 00	25 54	44	46
Swan	Baltim'e, 7th	42 00	40 00	38 00	36 00	32 00	28 00	29 00	35	38
J. W. Paine	N. York, 28th	39 00	38 00	36 00	33 00	32 00	27 00	30 55	36	39
Wild Pigeon	" 6th	42 00	42 00	41 00	38 00	34 00	29 00	27 10	35	37
Siri*	" 14th	51 00	42 00	41 00	39 00	38 00	27 00	28 00	47	50
Magellan	Boston, 10th	48 00	36 00	34 00	32 00	30 00	27 00	27 55	39	41
Parthenon	" 13th	38 00	37 00	36 00	34 00	31 00	27 00	29 38	38	41
Arthur*	N. York, 25th	41 00	39 00	37 00	35 00	33 00	27 00	29 30	52	55
Lady Franklin* . .	" 2d	34 00	32 00	30 00	29 00	28 00	24 00	24 12	43	46
Pemamaquon . . .	Boston, 25th	39 00	38 00	37 00	35 00	33 00	29 00	31 47	44	48
Kate and Alice . . .	N. York, 14th	37 00	35 00	34 00	34 00	31 00	28 00	28 00	36	39
Means		41 00	38 00	35 46	34 45	32 31	28 49	30 02	37.3	39.9
Means of the best six		39 10	37 50	36 20	35 00	32 40	28 10	30 34	31	34

* Forced to the eastward; not included in the mean crossings. The Ann Maria, Medford, and Lady Franklin took the old route. The A. F. Jenness, Tonia, and Arthur attempted to split the difference. The Jenness is evidently a very dull sailer.

New Route Crossings—Continued. OCTOBER.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Comet	N. York, 2d	45°00′	41°00′	37°00′	35°00′	32°00′	29°00′	31°00′	25	27
Russell	" 3d	41 00	36 00	33 00	31 00	29 00	26 00	28 12	36	39
Miantonomi* . . .	" 3d	46 00	46 00	45 00	41 00	41 00	37 00	34 00	47	51
Somerset	Boston, 4th	51 00	44 00	38 00	35 00	31 00	29 00	30 25	43	46
Wild Pigeon	N. York, 14th	40 00	36 00	32 00	31 00	32 00	28 00	28 00	27	29
Golden Gate	" 14th	40 00	36 00	32 00	32 00	32 00	27 00	28 00	27	29
Miguelon (barque)* .	Salem, 15th	48 00	45 00	49 00	34 00	33 00	30 00	32 00	40	43
Helena	N. York, 30th	50 00	44 00	40 00	40 00	40 00	37 00	32 10	39	45
Sam'l Lawrence . . .	Boston, 20th	39 00	33 00	32 00	31 00	29 00	27 00	29 38	30	32
Golden City	N. York, 24th	41 00	38 00	37 00	36 00	35 00	31 00	33 27	28	31
Ringleader	Boston, 21st	44 00	39 00	37 00	36 00	34 00	31 00	34 00	28	31
Le Cocq*	" 2d	35 00	35 00	34 00	33 00	31 00	29 00	30 19	44	47
Edwin*	" 11th	32 00	28 00	27 00	26 00	24 00	22 00	25 00	41	44
W. G. Lewis	" 9th	36 00	35 00	35 00	35 00	34 00	31 00	31 23	37	41
Angelique	N. York, 18th	43 00	35 00	34 00	32 00	29 00	28 00	30 38	37	40
Dragon	Boston, 29th	40 00	33 00	29 00	30 00	29 00	29 00	30 47	28	30
Coquimbo*	" 28th	41 00	38 00	35 00	33 00	30 00	27 00	28 34	42	45
Lucy Elizabeth* . .	" 12th	26 00	24 00	25 00	26 00	24 00	22 00	25 00	38	41
Sam'l Russell . . .	N. York, 6th	33 00	32 00	32 00	32 00	32 00	31 00	31 27	30	32
Bald Eagle	" 3d	45 00	47 00	45 00	42 00	38 00	31 00	30 41	32	34
Roscoe†	" 2d	46 00	48 00	48 00	48 00	45 00	33 00	34 15	53	56
Iconium	" 29th	43 00	39 00	35 00	34 00	32 00	30 00	30 30	42	45
Westward-Ho* . . .	Boston, 17th	30 00	28 00	29 00	29 00	28 00	28 00	29 30	29	32
Eureka	N. York, 5th	34 00	34 00	33 00	31 00	31 00	28 00	29 30	26	28
Piscataqua	Boston, 28th	48 00	37 00	35 00	34 00	32 00	29 00	31 15	43	46
Malay	N. York, 14th	40 00	37 00	37 00	34 00	31 00	29 00	31 12	35	38
Squantum†	Boston, 2d	51 00	43 00	41 00	40 00	37 00	35 00	32 50	44	48
Means		41 44	37 00	34 50	33 41	32 06	29 25	30 40	32.7	35.5
Means of the best six		40 40	37 20	34 40	33 30	32 40	29 00	30 39	26.8	29.2

* Forced to the eastward; not included in the mean crossings, though neither of them, although they crossed so far west, had any difficulty with Cape St. Roque.

† Fell to leeward.

New Route Crossings—Continued. NOVEMBER.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Celestial	N. York, 2d	45°00′	37°00′	32°00′	32°00′	30°00′	28°00′	31°00′	24	26
Newton	Boston, 7th	42 00	42 00	41 00	40 00	38 00	35 00	32 30	34	38
Flying-Fish	" 7th	49 00	42 00	36 00	35 00	34 00	30 00	32 00	19	21
R. C. Winthrop . . .	" 8th	42 30	42 00	41 00	30 00	37 00	34 00	32 30	32	35
Swordfish	N. York, 12th	44 00	39 00	37 00	36 00	35 00	31 00	32 00	23	25
Horatio	" 18th	44 00	33 00	31 00	30 00	29 00	29 00	30 30	25	27
Esther May	Boston, 19th	35 00	32 00	33 00	33 00	32 00	31 00	31 00	27	31
Lucia Field (barque) .	" 20th	37 00	34 00	31 00	30 00	29 00	28 00	31.00	31	34
Geo. Brown	Philad., 24th	41 00	35 00	32 00	30 00	28 00	28 00	29 00	29	34
Esther May	Boston, 19th	38 00	33 00	32 00	33 00	32 00	30 00	31 45	27	29
Uriel	N. York, 27th	45 00	39 00	36 00	33 00	31 00	29.00	30 00	26	30
Tuscany	" 28th	43 00	36 20	34 30	33 20	32 20	30 20	32.00	42	45
Contest	" 16th	48 00	37 46	36 00	35 30	33 00	29 56	31 00	27	29
Living Age	" 24th	42 50	40 00	35 00	32 00	28 40	26 00	28 30	29	32
Alboni	" 21st	46 00	39 30	37 50	35 30	32 45	32 00	32 20	26	28
Thos. Church . . .	" 20th	48 00	37 00	34 00	32 00	29 00	26 00	29 40	29	32
Walter	" 29th	49 30	45 20	39 40	36 40	34 00	30 30	31 00	33	35
Danube	" 13th	50 00	36 00	35 06	32 40	32 00	29 30	29 20	37	40
Trade-Wind	" 13th	49 00	30 00	30 20	31 00	30 20	30 00	34 00	22	26
Tingqua	" 24th	43 00	40 00	39 25	37 45	33 50	31 20	32 00	20	23
Gray Feather . . .	" 8th	38 30	34 40	35 40	35 00	32 30	29 00	32 00	32	34
Kentucky	Boston, 24th	46 30	39 25	36 34	34 50	33 00	30 20	32 45	24	27
Cygnet	" 3d	39 30	36 00	31 25	30 00	28 00	26 00	30 00	38	41
Telegraph	" 15th	49 00	40 00	34 40	34 30	31 45	30 00	32 00	27	29
Sophronia	Salem, 6th	40 30	41 12	41 10	39 00	36 40	32 20	30 20	32	35
Cyclone	Boston, 2d	49 00	47 00	46 00	41 00	38 00	34 00	34 55	30	33
Eagle	N. York, 4th	51 00	39 00	38 00	35 00	35 00	32 00	32 07	31	33
Robert Wing . . .	" 14th	47 00	42 00	38 00	36 00	33 00	30 00	32 05	30	32
Humboldt	" 24th	37 00	32 00	33 00	34 00	33 00	30 00	30 10	37	39
Richard Alsop . . .	" 9th	42 00	31 00	32 00	32 00	30 00	27 00	30 53	31	33
Westward-Ho . . .	" 15th	40 00	38 00	37 00	34 00	33 00	32 00	31 47	24	27
Dashing Wave . . .	Philad., 27th	53 00	48 00	42 00	40 00	39 00	34 00	33 15	28	33
Grayhound	C. Henry, 27th	44 00	32 00	32 00	32 00	32 00	30 00	30 05	33	36
California	Boston 3d	46 00	38 00	35 00	33 00	30 00	29 00	31 30	35	39
North Carolina* . .	N. York, 25th	41 00	29 00	29 00	29 00	29 00	28 00	29 03	37	40
Parana	" 6th	44 00	40 00	38 00	35 00	34 00	30 00	31 54	30	32
Suwarrow*	" 25th	39 00	35 00	34 00	32 00	28 00	28 00	29 20	46	49
Means		44 13	39 22	35 50	34 07	32 36	30 07	31 11	29.3	32.4
Means of the best six		45 40	36 50	34 17	33 27	32 01	29 53	30 55	22.2	24.7

* Forced to the eastward; not included in the mean crossings.

New Route Crossings—Continued. DECEMBER.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
		Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
Southerner (barque)†	N. York, 1st	40°00′	41°00′	40°00′	38°00′	35°00′	32°00′	30°00′	38	42
Hazard	" 4th	45 00	41 00	39 00	38 00	35 00	32 00	32 00	21	24
Samuel Russell	" 5th	53 00	46 00	43 00	41 00	36 00	32 00	30 00	19	20
Element	" 5th	44 00	42 00	39 00	36 00	33 00	31 00	31 00	22	24
Grafton (barque)	" 8th	35 00	31 00	33 00	32 00	32 00	30 00	29 00	29	31
Lantao	" 8th	44 00	41 00	41 00	41 00	37 00	31 00	29 00	30	32
St. Lawrence, U.S. frig'te	" 12th	42 00	39 00	36 00	35 00	33 00	30 00	31 00	31	34
Seaman's Bride	" 12th	41 00	40 00	40 00	36 00	34 00	30 00	31 00	28	32
Portsmouth (U. S. ship)	Boston, 16th	36 00	39 00	38 00	38 00	36 00	33 00	31 00	26	30
Hurricane	N. York, 17th	45 00	42 00	41 00	40 00	38 00	34 00	34 00	27	30
Benjamin Howard	Boston, 25th	41 00	35 00	33 00	32 00	29 00	26 00	27 00	25	28
Pontiac	" 25th	43 00	38 00	36 00	35 00	32 00	30 00	30 00	23	27
Winged Racer	N. York, 12th	39 00	36 00	34 30	32 00	30 00	28 15	31 00	22	24
Golden Gate	" 6th	46 14	40 30	37 00	35 10	33 30	31 20	33 56	20	23
John Holland	" 1st	45 30	42 10	38 40	36 50	33 40	29 14	31 00	39	43
Storm (barque)	" 21st	44 00	41 00	39 00	37 30	34 45	33 30	35 30	18	25
Golden West	Boston, 13th	41 00	39 20	38 30	38 20	36 00	34 00	31 20	28	30
Dancing Feather (sch'r)	" 12th	53 00	47 30	43 00	38 51	34 30	30 00	30 42	33	35
John Bertram	" 12th	49 30	45 20	44 00	38 13	36 45	31 00	29 30	27	29
Flying Childers	" 18th	49 30	47 30	43 30	41 00	36 40	32 30	30 40	23	25
Aldebaran	" 25th	39 20	36 20	36 10	32 50	29 15	26 10	28 00	37	40
Seargo	N. York, 14th	36 00	33 00	31 00	29 00	28 00	26 00	29 31	33	38
Eagle Wing	Boston, 21st	39 00	37 00	38 00	37 00	34 00	30 00	29 30	25	27
Ottawa	N. York, 19th	45 00	43 00	39 00	37 00	33 00	30 00	29 21	26	29
Grayhound	Richmond, 7th	38 00	35 00	33 00	32 00	30 00	29 00	31 12	26	28
Roman	N. York, 20th	43 00	38 00	37 00	35 00	33 00	31 00	30 08	21	23
David Brown	" 13th	44 00	34 00	30 00	31 00	31 00	30 00	32 15	20	23
Lightfoot	" 2d	50 00	33 00	32 00	32 00	31 00	30 00	32 00	24	28
Indus	Baltim'e, 13th	52 00	39 00	35 00	34 00	29 00	28 00	30 55	22	26
Ludwig*	N. York, 31st	39 00	33 00	32 00	31 00	30 00	26 00	25 19	35	38
Gray Eagle	Philad., 11th	48 00	43 00	39 00	37 00	34 00	31 00	32 45	22	25
J. Maxwell*	C. Henry, 2d	41 00	34 00	30 00	29 00	28 00	27 00	28 33	33	36
Retriever*	St. Johns, 8th	31 00	28 00	25 00	23 00	23 00	22 00	20 02	50	54
Virginia*	N. York, 8th	39 00	37 00	34 00	31 00	28 00	27 00	27 20	37	40
Telegraph	Boston, 2d	45 00	42 00	39 00	39 00	38 00	34 00	33 45	22	26
Means		44 21	39 34	38 11	35 31	33 22	30 29	30 51	25.6	28.6
Means of the best six		45 50	40 00	37 30	36 10	33 40	31 30	32 13	19.8	23

* Forced to the eastward, not included in the mean crossings.

† Fell to leeward.

Old and Middle Route Crossings.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
		30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
Boston¶ . . .	Boston, Jan. 1st	32°00′	28°00′	27°00′	26°00′	25°00′	23°00′	24°50′	27	31
Star of the Union	" " 28th	35 40	33 00	29 00	29 50	29 45	29 20	29 50	34	36
Wisconsin¶ . .	N. York, " 20th	30 00	30 30	31 00	31 00	28 00	27 00	28 11	25	28
Vandalia¶ . .	" " 20th	31 00	29 30	27 00	26 30	26 30	26 00	28 00	37	41
Pontiac . . .	Boston, " 20th	46 00	38 00	34 00	33 00	31 00	29 00	29 40	46	49
Tsar	" " 12th	44 00	32 00	38 00	34 00	31 00	28 00	27 30	30	33
Windward . .	Baltimore, " 13th	53 00	43 00	39 00	37 00	32 00	29 00	29 34	37	40
St. Lawrence¶ .	N. York, Feb. 8th	31 30	29 30	28 00	28 30	28 15	28 00	28 00	36	41
Bark Emily¶ .	Philad., " 20th	33 00	31 30	30 40	29 40	28 40	28 30	28 40	30	34
M. Hawes† . .	N. York, " 22d	40 00	32 00	30 00	27 00	26 30	26 00	26 18	35	41
St. Lawrence¶ .	" " 9th	31 00	30 00	28 00	28 00	28 00	28 00	28 00	34	38
Roscoe† . . .	" " 27th	48 00	34 00	32 00	31 00	30 00	29 00	28 00	33	35
Wm. Price† . .	Philad., " 20th	42 00	37 00	34 00	31 00	28 00	27 00	26 20	31	35
Weybosset . .	N. York, " 23d	38 00	36 00	34 00	32 00	29 00	27 00	26 00	32	36
Gleaner . . .	" " 24th	38 00	37 00	37 00	33 00	30 00	28 00	27 15	32	36
Rose Standish¶ .	" March 1st	33 00	29 00	28 00	27 00	26 30	26 00	27 00	27	30
Ariel¶	" " 10th	33 00	31 00	30 30	29 30	28 00	26 30	26 26	30	34
Harriet Hoxie¶ .	" " 24th	30 00	26 00	28 00	28 30	29 00	29 30	30 20	27	30
Golden Era† .	" " 25th	40 00	38 00	38 00	34 00	31 00	28 00	26 20	38	41
Rosario . . .	" " 6th	35 00	27 00	27 00	27 00	27 00	26 00	27 16	28	31
Vandalia¶ . .	Baltimore, " 9th	31 00	30 00	29 00	29 00	27 00	25 00	24 36	45	48
Relief, U. S. S. .	N. York, " 24th	38 00	36 00	33 00	31 00	29 00	27 00	26 30	29	32
Mary Annah† .	" " 21st	47 00	37 00	34 00	32 00	30 00	29 00	26 56	31	34
Queen of the East¶	" April 8th	31 00	27 00	27 00	26 00	25 00	23 00	23 00	31	36
Thames† . . .	Portland, " 24th	50 00	42 00	38 00	33 00	30 00	25 00	26 08	41	44
Rome¶	N. York, " 26th	32 00	30 00	30 00	29 00	26 00	25 00	26 00	43	46
Arthur Pickering	Salem, " 30th	38 00	36 00	36 00	33 00	29 00	26 30	27 50	36	39
Mayflower . .	N. York, " 2d	34 00	30 00	30 00	30 00	29 00	28 31	31 00	30	32
Amazon . . .	" " 7th	37 00	35 00	32 00	31 00	29 00	28 00	29 06	32	35
Linwood† . . .	Baltimore, " 15th	52 00	34 00	32 00	32 00	29 00	28 00	29 51	33	36
Sophronia¶ . .	Boston, " 16th	30 00	28 00	28 00	29 00	28 00	28 00	30 27	34	37
Cleopatra¶ . .	" " 23d	30 00	28 00	28 00	28 00	28 00	28 00	31 33	24	27
Nestorian† . .	N. York, " 24th	36 00	34 00	35 00	33 00	30 00	27 00	29 32	31	35
Milton	Boston, May 15th	37 00	36 30	35 00	32 00	27 30	26 00	28 15	37	40
Albany† . . .	N. York, " 24th	39 00	37 00	35 00	33 00	30 00	27 00	27 30	42	45
N. B. Palmer .	" " 2d	40 00	33 00	32 00	30 00	27 00	25 00	28 50	24	26
Probus	" " 25th	34 00	32 00	30 00	29 00	28 00	26 00	30 00	54	57
Union† . . .	" " 19th	38 00	36 00	34 00	32 00	31 00	29 00	24 37	44	47
Rubicon¶ . .	" " 15th	30 00	28 00	28 00	26 00	24 00	17 00	20 48	42	45
Harrisburg¶ . .	" " 10th	33 00	31 00	29 00	29 00	28 00	27 00	29 35	43	46
F. P. Sage . .	" " 27th	36 00	33 00	32 00	31 00	29 00	28 00	31 36	52	55
Rockland¶ . .	" " 22d	29 00	28 00	28 00	27 00	27 00	28 00	30 15	35	38
Nestorian¶ . .	" " 28th	33 00	30 00	29 00	29 00	26 00	19 00	25 40	53	56
Lamartine . .	" June 10th	34 00	32 00	31 30	31 00	29 00	26 00	28 49	33	37
Z. D.†	" " 15th	39 00	37 00	35 00	34 00	33 00	24 30	28 50	35	37
Sarah H. Snow†	Boston, " 23d	39 00	36 00	33 00	31 00	29 00	23 00	27 00	38	42
Talbot	N. York, " 27th	35 30	34 00	30 00	28 30	25 00	19 00	25 00	41	43
Thetis	" " 29th	34 00	32 00	30 00	27 00	25 00	24 30	30 48	43	46
Hero†	" " 21st	49 00	44 00	41 00	38 00	34 00	25 00	29 25	42	44
Messenger† . .	Philad., " 4th	38 00	37 00	36 00	32 00	28 00	26 00	28 00	30	33
Inez†	Boston, " 3d	35 00	33 00	31 00	29 00	26 00	21 00	24 34	48	50
Horsburgh† . .	N. York, " 1st	35 00	32 00	31 00	31 00	30 00	24 00	28 00	47	50

† Started on the new route, but abandoned it.

¶ Old route.

Old and Middle Route Crossings—Continued.

NAME OF VESSEL.	SAILED FROM.	LONGITUDE OF CROSSING PARALLELS OF— 30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	CROSSED EQUATOR. Long. W.	Days.	PASSED ST. ROQUE. Days.
Plato†	Boston, July 1st	40°00′	36°00′	34°00′	29°30′	26°00′	20°00′	27°00′	35	37
Wessacumcon† .	" " 7th	41 00	39 00	35 00	30 00	25 00	23 00	29 00	50	54
Eagle†	N. York, " 11th	49 00	47 30	46 30	44 30	44 00	23 00	28 00	33	35
Cohansey† . .	" " 20th	46 00	43 00	40 00	37 00	34 00	24 30	28 56	35	38
Arab†	Boston, " 7th	45 00	41 00	38 00	34 00	29 00	19 00	26 08	33	36
Wisconsin† . .	N. York, " 7th	42 00	39 00	37 00	33 00	28 00	22 00	27 50	35	37
Weybossett† .	Boston, " 1st	44 00	41 00	38 00	34 00	29 00	27 00	31 30	41	44
Boston† . . .	N. York, " 4th	42 00	39 00	36 00	32 00	29 00	21 00	28 30	36	39
Edwin† . . .	Boston, Aug. 26th	47 00	44 00	42 00	35 00	28 00	23 00	24 00	54	57
Manchester† . .	N. York, " 19th	42 00	35 00	30 00	27 00	25 00	19 00	18 34	55	58
Emily† . . .	Philad., " 27th	37 00	34 00	32 00	31 00	29 00	25 00	30 04	52	54
Raritan, U. S. F.¶	Norfolk, " 24th	19 00	22 00	24 00	27 00	24 00	21 00	24 50	55	58
Oriental† . . .	Boston, " 13th	39 00	38 00	37 00	36 00	35 00	20 00	20 25	55	58
Chenango† . .	Baltimore, " 22d	47 00	44 00	42 00	38 00	35 00	26 00	25 39	58	61
John Wade . .	Boston, Sept. 5th	45 00	42 00	41 00	39 00	32 00	24 00	29 00	34	37
U. S. S. Relief .	N. York, " 27th	42 15	38 30	37 15	31 42	27 00	25 20	28 00	53	57
Ann Maria¶ . .	" " 11th	30 00	29 00	28 00	27 00	24 00	22 00	26 50	44	46
Tonia†	C. Canso, " 1st	40 00	39 00	37 00	34 00	26 00	22 00	26 10	40	42
Medford† . . .	Boston, " 19th	35 00	30 00	29 00	28 00	26 00	21 00	25 54	44	46
Siri†	N. York, " 14th	51 00	42 00	41 00	39 00	38 00	27 00	28 00	47	50
Arthur† . . .	" " 25th	41 00	39 00	37 00	35 00	33 00	27 00	29 30	52	55
Lady Franklin .	" " 2d	34 00	32 00	30 00	29 00	28 00	24 00	24 12	43	46
Lewis	Salem, Oct. 10th	37 00	33 00	30 00	27 00	26 00	25 00	28 00	34	37
Sartelle . . .	N. York, " 23d	39 00	28 00	29 00	28 00	27 00	24 00	26 55	43	46
Le Cocq . . .	Boston, " 2d	35 00	35 00	34 00	33 00	31 00	29 00	30 00	44	47
Edwin¶ . . .	" " 11th	32 00	28 00	27 00	26 00	24 00	22 00	25 00	41	44
Coquimbo . .	" " 28th	38 00	35 00	33 00	32 00	30 00	27 00	28 34	42	45
Lucy Elizabeth¶	" " 12th	26 00	24 00	25 00	26 00	24 00	22 00	25 00	38	41
Loo Choo . . .	" Nov. 2d	35 30	35 00	35 00	33 00	30 00	27 00	30 00	34	37
Juniata¶ . . .	Baltimore, " 23d	30 00	27 00	27 30	27 30	27 30	27 30	28 00	28	30
Europe	N. York, " 25th	37 00	30 00	28 00	26 00	25 30	25 30	26 22	32	35
Cygnet	Boston, " 3d	39 00	36 00	31 00	30 00	28 00	26 00	30 00	38	41
North Carolina†	N. York, " 25th	41 00	39 00	29 00	29 00	29 00	28 00	29 03	37	40
Suwarrow . .	" " 25th	39 00	35 00	34 00	32 00	28 00	28 00	29 20	46	49
John Stuart¶. .	" Dec. 9th	29 20	33 20	34 50	34 00	31 00	29 30	31 40	35	38
Aldebaran† . .	Boston, " 25th	39 00	36 00	36 00	32 00	29 00	26 00	28 00	37	40
Seargo	N. York, " 14th	36 00	33 00	31 00	29 00	28 00	26 00	29 31	33	38
Ludwig . . .	" " 31st	39 00	33 00	32 00	31 00	30 00	26 00	25 19	35	38
Retriever¶ . .	St. Johns, " 8th	31 00	28 00	25 00	23 00	23 00	22 00	20 02	50	54
J. Maxwell . .	C. Henry, " 2d	41 00	34 00	30 00	29 00	28 00	27 00	28 33	33	36

† Started on the new route, but abandoned it. ¶ Old route.

Now and then, I hear of a mariner who "does not believe in the new route." I hope all who are skeptical will examine the foregoing tables attentively. The crossings by the new route, afford an example for every day in the year, and of all the 365 vessels there recorded, but four, have fallen to leeward of Cape St. Roque, and in consequence thereof, their passage from the U. States to the fair way of St. Roque, was prolonged only three days on the average, and their mean place of crossing the equator was in long. 36°. Notwithstanding this, the average passage of the four, from the U. States to the parallel of St. Roque, was one week less than the average to the same parallel by the old route.

The table of crossings by the *old* and *middle routes*, gives the passages of ninety odd vessels. The masters of these evidently did not have faith enough in the Charts, to justify them in their opinion in sticking to the Sailing Directions; some disregarded them altogether; some attempted to "split the difference," and take a middle course between the old and the new routes; but the table shows how dearly they paid for their doubts—their passages on the average are only eight days—25 per cent.—longer than the average from the U. States by the new route; the difference being as 31 to 39.

Now, if we take the mean of the best six passages, for each month by the new route, we shall have the elements for a mean monthly average, derived from 72 vessels, which gives 24 days to the line; the mean crossing place being on the meridian of 30° 50′, or about 30′ west of the average of the whole 365. The shortest monthly runs being from November to April inclusive, and varying, for these months, from 20 to 22 days. The longest are from June to October inclusive; they vary from 25 to 31 days. Long. 32° 13′ is the most westerly crossing of these monthly means—being the mean place of crossing of the best six in December.

Lieut. Kennedy, commanding the U. S. storeship Supply, on her recent voyage to Rio, mentions a striking instance of the advantage of sticking to the Charts, and conforming to the Sailing Directions. He crossed in the month of February, 34 days out, in long. 33° W. He was pinched, and made the land 7 miles to leeward of Cape St. Roque. He stood boldly on; took advantage of a slant, as recommended, and got by without any difficulty. The barque Polka, however, which was in company, stood off to the northward and eastward in order to get an offing, and pass to windward of the Island of Fernando de Noronha. This brig, though a better sailer than the Supply, did not arrive until several days after the Supply.*

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* *Extracts from Log of the United States storeship Supply, Lieutenant C. H. Kennedy, commanding.*

January 6, 1850 (lat. 39° N.; long. 63° W.); at 10 A. M., a whirlwind passed between our fore and mainmasts, doing no damage. At the same time, two others were observed, one on the port-beam, the other on the starboard quarter. Their formation was very sudden, giving no warning whatever of their approach; nor was the *force* or direction of the wind, which, at the time, was blowing fresh, in the least affected; the diameter of the one which passed between our masts was about ten feet, with a rotary velocity of about one hundred miles per hour, and a progressive velocity of about sixty or seventy miles per hour. The one on the port-beam was much larger, carrying with it large quantities of water, and moving with a higher velocity.

February 6, 1850 (lat. 1° 40′ N.; long. 32° W.); at 3 hours 30 min., a large and heavy whirlwind passed across our bow, about two hundred yards distant, with a very high velocity, and carrying with it large quantities of water.

The ship did not sail well during the first part of the passage, having been stored out of trim, and griping to such a degree that all the sails on her mizzenmast were useless. I could not make any change in her trim by shifting weight from one extreme (a bad way at best), as every crack and crevice was crammed with stores, baggage, &c.

The chief point of information as to the new route, appears now to be in the practical answer to this question: Which is the best way of crossing the "equatorial calms?" The region most liable to these calms is, as I have before explained, wedge-shaped, with the point of the wedge directed towards South America.

The winds in these calm regions are often from the southward and westward; indeed, as you approach the coast of Africa in summer and fall, these southwardly winds assume the character of a regular monsoon.

The place of these calms varies, too. It is sometimes at the equator; sometimes in 5°, 10°, or even in 15° north, according to the season of the year.

And the answer to the question, "How to cross them?" is this. Unless you are fearful of falling to leeward, or you are already too far to leeward, and want to make easting in the southwardly winds of the doldrums, do your best to make southing, for by that course you will clear them soonest. By that course you run directly across them; by an east or west course, you run along with them.

It appears, however, by these tables, that the average passages to the equator, by the new route, have been greatly reduced.

Moreover, by comparing the new route crossings with the "middle route," as the tracks made by those navigators who attempt to "split the difference" between the old route and the new are called, we shall see how much they lose: they lose on the average, during a portion of the year, a week or more, and several days at any season.

It will not escape the notice of men who study these tables as carefully as they ought to be studied,

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The first part of the passage was rough, and the southwesterly winds drove me far out of my track. I was at one time apprehensive of being forced in sight of the Cape de Verde Islands.

When the trade-winds north of the equator began to fail me, the weather became squally, and the wind light; though, in general, the squalls were of rain only.

On the 6th of February, however, we had some wind in them, and a violent whirlwind passed ahead of the ship about two hundred yards. It would have passed over the ship, had it not been met and driven ahead of a squall.

I was forced across the line in long. 32° 50′ on the 7th of February. To avoid being back-strapped, I stood to the east for twelve hours between the 8th and 9th, and twenty-one and a half hours between the 10th and 11th; but I am now inclined to believe that I might have fetched past St. Roque by standing on. On the 11th, stood in for the land, and made it on the 12th at 2 P. M. At 3 hours 30 min., tacked ship in a half twelve; shells and gray sand mixed with coral, which was the general character of the soundings every time we got bottom. Stood off shore; 4 hours 45 min., tacked and laid up along the land, which was again made on the 13th; stood in to ten fathoms, and tacked at 2 hours 30 min. P. M. Cape Branco bearing, per compass, S. by W. ½ W., distant about thirty miles, and the land abeam, distant about eight miles. At 9 P. M., tacked again and laid well up along the land, which we did not again see till we made Cape Frio. The wind fanned us on both tacks, and when we "went about" the last time, we made a S. by E. compass course. Thus we cleared the land in two off shore tacks, each of 5 hours 30 min., the current sweeping *along* or *off* shore. The distance run per log is six thousand five hundred and sixty-three miles. No vessel that sailed in January has yet arrived. We spoke the Green Point between 1° and 2° N., and 30° 54′ W., bound to Rio; she had sailed two days before us (January 1) from New York. We also saw the barque Polka standing in for the land on the afternoon of the 10th of February. We were on the opposite tack, having gone about to avoid the bight to the westward of St. Roque.

I have endeavored to obtain accurate information of the passages made in December, but the Register is so loosely kept that I can learn nothing more than the number of days of the voyage, not even the time of sailing or arrival, or the meridian on which they crossed the equator.

that from May to November, inclusive, vessels that go the new route cross the parallel of 5° N. farther to the eastward, on the average, than they do the equator. The cause of this is obvious: it is owing to the monsoons of the doldrums. Hence, we deduce a rule which will apply to all months, and it is this: When you cross the parallel of 10° N. in 30°, or 31°, or 32° W., and can make a south course good, don't care to go any farther east. Of course, if you meet these southwest monsoons, as in the summer and fall you will sometimes do, even as far west as 32°, you will in that case be compelled to obey the winds, and make easting; but when you are east of 30°, always prefer the tack that will give you most southing, because it will put you across the doldrums soonest; and if it bring you across no farther west than 31°, or even 32°, you may consider yourself in a good position, and clear of a region of light airs and baffling winds.

The average passage for the year by the "middle" route is 39 days; by the old, it is 41; by the new, 31.

It is hoped that this exhibit will serve to convince the skeptical that these Charts are what-they purport to be: *i. e.* the result of the experience of all the navigators, whose logs I could lay hand on for comparison, and that they are not based on *any* theory of *any* body.

Some vessels are put down on the middle route, which did not intend to take it. They were forced farther to the eastward, before crossing the horse latitudes, than they intended to go. They did the best they could; and might have been classed under the new route; for when winds are ahead, the "new route" expects the navigator to do the best he can, for head winds will now and then drive him broad off the track.

If the few passages that come under this category had been so classed, the contrast in favor of the new route would have been still more striking than it is.

There is a remarkable conformity between the average track by the crossing tables and the computed route, or what may, in some sort, be called the theoretical route; inasmuch as it was predicated on the Pilot Charts, and is the deduction entirely of figures and calculation.

Thus, the average crossings of the six vessels that made the best passages in February, were in reality—

Latitudes: 30°, 25°, 20°, 15°, 10°, 5°, in longitude 44° 16′; 40° 53′; 38° 37′; 36° 14′; 34°; 31° 12′; 30° 8′ W. By table: 45° 40′; 37° 45′; 35° 35′; 33° 28′; 31° 23′; 31° 23′ W.

It appears from this, that the best average route which, according to the Pilot Charts, a vessel should take to reach the equator in February, deviates from the mean of the six best tracks that have been actually made, nowhere more than seventy-five miles.

Thus, we find that the routes of the tables have stood every test. The time it would take to make the passage by them was computed beforehand, entered in the tables, and recommended to navigators for adoption. Ships try the route, and find the time correct.

The distance to be sailed through the water, taking into the account the detour which a vessel under canvas must make on account of head winds, was calculated. Trial proves the tables surprisingly correct here, too, for navigators have kept their run by the log, summed it up at the equator, turned to the

computed distance to be sailed by the new route for that month, in the tables, and found the two agreeing, in some cases, within ten miles of each other, and seldom differing in any over a hundred. In a voyage of four thousand or five thousand miles, a steamer could not run closer to the actual distance than this.

But of all the tests to which these calculated routes were to be subjected, perhaps the severest one was that which related to the track which the vessel should make through the water—the path she was to follow over the ocean, in order to make these quick runs.

The winds had been tabulated, the currents had been considered, and, taking into account these fickle and very subtile elements, with such arguments as might be legitimately drawn from the doctrine of chances, the actual course which a vessel under all these influences would make from day to day on her destination was, like the path of a comet through the skies, made the subject of calculation, determined and announced.

Now, when we come to compare the mean track, for any month, of the vessels that have best fulfilled the requirements of the new route with the track of the tables, we find the two tracks identical. These tracks are quite as close together, as would be the tracks of the individual vessels of a fleet attempting a voyage of such a length in company.

Practical illustrations of this are frequently afforded, especially by smart ships, ably commanded and well navigated. The morning mail brings a striking case of this in the abstract log of the clipper ship Sword Fish (H. N. Osgood), just returned from a voyage of circumnavigation, which she has accomplished, including 35 days in port, in ten months and ten days. In this time she logged 39,977 miles, and averaged 153 miles per day.

She sailed from New York, bound to California, April 3, 1854, and the following remarks are entered in her abstract log, for the 22d of that month. "Fine weather; at meridian I am on the equator, after a passage of 18 days and 15 hours from Sandy Hook; and believed to have followed Maury's track for this month, and am satisfied of its correctness. Distance logged to line, 4,002 miles."

Maury's computed distance for April, 4,051 miles, and for this part of the voyage she averaged 8.95 knots the hour. Thus, these Charts are bringing out the fact that there are, upon the broad ocean, great highways or turnpikes, if you please, almost as clearly marked out by the winds and the currents, as are the common highways of the earth by marks upon the land.

I have frequently recommended vessels that happen, as now and then they will, in attempting the new route, to find themselves too far to the westward as they approach the doldrums, not to tack and stand back to the northward, but rather to stand on and take advantage of all the chances that will be offered, especially in summer and autumn, on two occasions; the first is when they enter the belt of southwardly monsoons in the doldrum region; the other is when they get the S. E. trades; for in each of these two regions the wind is often so well to the southward as to admit of an east course. That it is so in the latter, has been illustrated in the course of this work by numerous examples; and at last I am enabled to quote an actual experiment made in illustration of the former by the barque Edna (J. L. Groton), from Pensacola to Rio last August. Her master, however, has returned a very imperfect abstract log, and which he thinks can be of no possible use. He promises to do better next time, it is true, but he should have recollected

his promise, and done his best from the beginning. His case is not an uncommon one, and, therefore, I take this occasion to say to all such, do your best every voyage, keep the log according to the form for every day you are at sea, send it to me if you please, and allow me to be the judge as to its value; perhaps I may find very precious gems in it, as in this instance, where the navigator himself little dreams there is anything of special value.

The Edna appears to be a dull sailer. Coming out of the Gulf of Mexico, she fell to the westward of the August track, crossing 18° N. in long. 40° 41′, instead of long. 30° as per the new route. She had the wind at east, and stood on boldly to the southward for the monsoons, resolved to take her chance of making easting in that belt. She reached the parallel of 8° N. in 41° W., and thought her chances better, for the wind was still at east. But if the worst should come to the worst, she could but go about, tack, stand to the northward, and beat. She, therefore, stood on, and accordingly the next day, in lat. 7° 00′, long. 40°, she got the monsoons from south, and ran east with them along that parallel for a week, when she found herself in long. 25°. Now, she had overshot the mark, for these monsoons being, for most of the time, at S. S. W., again placed her to leeward, but on the opposite side of her proper track. She had now to put about, beat, and go back to the meridian of 29° before she got far enough south to clear these monsoons. Her mistake was in not edging more to the south when she was standing to the eastward in the monsoon belt.

In reviewing the Rio routes, which include the routes of all vessels bound from the North into or through the South Atlantic Ocean, and comparing them, as they are recorded in this work, with the routes as they formerly were, we find the gain, on the average, by the new route over the old, to be for

January,	2.7 days.	May,	8.5 days.	September,	5.6 days.
February,	7.9	June,	7.6	October,	6.4
March,	15.1	July,	15.0	November,	13.3
April,	7.6	August,	9.2	December,	13.0

The passage to the line by the old route the year round was forty-one days. By the new route, notwithstanding the bad running in September, it is thirty-one days.

A saving of twenty-five per cent. in time, for all the men and the commerce that pass that way, is certainly an achievement, which those who have co-operated, and worked together to bring about, may well contemplate with pleasure and satisfaction. And who are they? Sailor-men, all; the navigator, who has assisted in the collection of materials at sea, and the brother officer, who has so faithfully and patiently helped to discuss them here.

FROM EUROPE TO THE LINE.

Since the publication of the sixth edition of the work, and the impulse which the Brussels Conference has given to the objects of it, I have received abstract logs enough to justify a preliminary discussion of the route from England and Europe in the Atlantic generally, to the line. The results of this investigation surprised me, and I am encouraged by them to think that that route, as beaten as it is, and notwithstanding it has been the great highway to India and the South Seas ever since the passages around the Cape of Good Hope and the Straits of Magellan were discovered, may be even now materially altered for the better. I think that this system of research will enable us to lay out tracks and project routes by which the passage from Europe to the line may be shortened several days, perhaps a week or more. Now this part of the route is common to all vessels bound from Europe into the other hemisphere, whether their destination be South America, Australia, or California, India, China, or the South Sea ports, the road for all is the same, as far, at least, as the equator; and even beyond, for this road is common also as far as the parallel of Cape St. Roque, indeed I might say as far as the polar edge of the S. E. trades. Now, considering the number of vessels that travel this common part of this grand highway, the merchandise they carry, the business they do, it will be at once perceived that if we can shorten the voyage along it, even by the saving of a single day, we shall effect an achievement of some consequence to the business of the world. If an engineer of some highway on the land, over which as much merchandise, property, and life are continually passing, should, by the display of any skill, device or artifice whatever, discover some short cut, which required no outlay to open or put in order, that would save the time and expense of even one hour's transportation; and if, further, he should secure the right to the discovery, with license to rig up a toll-gate, that all who use this new way should be reasonably taxed, people would willingly pay, and his revenue would be princely. But happily there are no toll-gates upon the high seas, and so far from taxing those whom we invite along this road, we offer them guides, charts, and sailing directions, without price.

Notwithstanding all the light which abstract logs and pilot charts and philosophical disquisitions have of late years thrown upon the subject of the winds in the North Atlantic, I find by this preliminary examination that the route from Europe to the line is at this day substantially that along which the early navigators and the Buccaneers groped their way to the South Seas. The following tables exhibit this route. They have been arranged by Lieuts. Minor and Muse from log-books taken at random.

Crossings from Europe to the Parallel of St. Roque.

NAME OF VESSEL.	SAILED FROM.	DAYS FROM EUROPE TO 30° N.	LONGITUDE OF CROSSING PARALLELS OF— 30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	CROSSED EQUATOR. Long. W.	Days.	PASSED ST. ROQUE. Days.
			Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
	JANUARY.										
Lotus	Gibraltar, 23d	5	19°00′	20°00′	21°00′	21°00′	20°00′	19°00′	18°00′	28	33
S. Brewer . .	Lisbon, 28th	4	17 00	20 00	22 00	25 00	24 00	23 00	23 00	19	22
Sachem . . .	Gibraltar, 1st	7	15 00	18 00	21 00	22 00	22 00	23 00	26 00	28	32
Duane . . .	Liverp'l, 27th	12	18 00	19 00	20 00	22 00	24 00	23 00	23 00	34	38
Northumberland	England, 1st	17	17 00	21 00	23 00	24 00	22 00	19 00	22 00	61	65
Restitution . . .	Gibraltar, 4th	6	16 00	22 00	21 00	20 00	20 00	19 00	21 00	30	35
Nueva Granadia	Cadiz, 28th	6	16 00	20 00	24 00	25 00	26 00	26 00	27 00	28	32
Coronation . .	Liverpool, 1st									54	57
Means . . .		8.1	17.0	20.0	21.7	22.7	22.7	22.0	22.8	40.2	44.8
	FEBRUARY.										
Carroll . . .	Cadiz, 3d	7	17 00	19 00	24 00	25 00	25 00	23 00	25 00	25	28
Roman . . .	London, 22d	10	19 00	21 00	24 00	26 00	27 00	26 00	25 00	22	25
Minerva . . .	Lisbon, 28th	4	19 00	18 00	18 00	19 00	19 00	18 00	22 00	23	27
Pilgrim . . .	England, 10th	11	24 00	24 00	26 00	26 00	23 00	20 00	20 00	44	49
Emu	" 26th	10	21 00	23 00	24 00	25 00	24 00	22 00	21 00	33	38
Clarendon . .	" 25th	10	20 00	22 00	24 00	26 00	24 00	21 00	22 00	30	34
Means . . .		8.6	20.0	21.1	23.3	24.5	23.6	21.6	22.5	29.5	33.5
	MARCH.										
Lowther Castle	England, 2d	32	18 00	21 00	23 00	25 00	23 00	22 00	22 00	66	69
S. Brewer . .	Lisbon, 10th	5	17 00	20 00	24 00	25 00	25 00	24 00	26 00	20	23
T. Campbell .	Scotland, 12th	12	19 00	22 00	25 00	25 00	24 00	20 00	24 00	40	43
Scotia	London, 24th	6	17 00	19 00	20 00	20 00	18 00	16 00	13 00	35	38
Means . . .		13.7	17.7	20.5	23.0	23.7	22.5	20.5	21.2	40.2	43.2
	APRIL.										
Tartar . . .	Liverpool, 4th	7	21 00	21 00	23 00	22 00	22 00	23 00	31 00	21	24
Logan . . .	Gibraltar, 19th	6	14 00	17 00	20 00	22 00	20 00	20 00	23 00	30	33
Earl of Clare .	London, 1st	12	18 00	21 00	26 00	26 00	26 00	22 00	22 00	36	40
Seringapatam .	Liverp'l, 30th	10	19 00	19 00	20 00	20 00	20 00	20 00	22 00	31	36
Leontine . . .	Bremen, 7th	12	18 00	20 00	24 00	25 00	25 00	23 00	24 00	39	42
T. Campbell .	London, 30th	14	19 00	20 00	20 00	19 00	20 00	20 00	25 00	34	37
Means . . .		10.1	18.1	19.6	22.1	22.3	22.1	21.3	24.5	31.8	35.3

Crossings from Europe to the Parallel of St. Roque—Continued.

NAME OF VESSEL.	SAILED FROM.	DAYS FROM EUROPE TO 30° N.	LONGITUDE OF CROSSING PARALLELS OF—						CROSSED EQUATOR.		PASSED ST. ROQUE.
			30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	Long. W.	Days.	Days.
			Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
	MAY.										
Albert Edward	Liverp'l, 24th	16	23°00′	24°00′	25°00′	26°00′	23°00′	22°00′	24°00′	35	38
Palmyra . . .	" 31st	9	22 00	24 00	25 00	25 00	23 00	22 00	24 00	27	30
Niagara . . .	Cadiz, 20th	5	17 00	20 00	22 00	25 00	24 00	23 00	24 00	26	29
M. de Somerulas	Gibraltar, 12th	8	18 00	19 00	20 00	22 00	24 00	21 00	23 00	35	38
Italy	Liverp'l, 23d	15	18 00	23 00	25 00	25 00	22 00	21 00	26 00	36	43
Siam	" 14th	17	20 00	23 00	25 00	25 00	24 00	19 00	26 00	38	41
Navigator . .	" 28th	11	17 00	20 00	23 00	26 00	27 00	22 00	24 00	29	32
Sachem . . .	Gibraltar, 18th	4	13 00	20 00	21 00	24 00	23 00	19 00	20 00	23	26
John Bull . .	Liverp'l, 15th	12	18 00	22 00	23 00	26 00	24 00	16 00	22 00	38	41
Persia . . .	London, 10th	7	18 00	21 00	24 00	25 00	24 00	19 00	26 00	34	37
Red-Jacket . .	Liverp'l, 4th	9	19 00	23 00	26 00	26 00	25 00	23 00	24 00	25	27
Leontine . . .	Bremen, 16th	11	14 00	18 00	21 00	22 00	23 00	22 00	26 00	31	34
Maine Law . .	Liverp'l, 3d		18 00	19 00	21 00	22 00	23 00	25 00	27 00	30	33
Means . . .		10.3	18.1	21.2	23.1	24.5	23.8	21.0	24.3	31.3	34.5
	JUNE.										
Albert Edward	Liverp'l, 15th	17	21 00	25 00	25 00	25 00	22 00	22 00	27 00	39	42
Allipore . . .	London, 15th	11	20 00	23 00	26 00	26 00	26 00	25 00	27 00	30	35
William Pitt .	England, 3d	15	18 00	19 00	23 00	25 00	23 00	16 00	19 00	58	62
Kensington . .	Havre, 8th	17	22 00	24 00	26 00	26 00	24 00	23 00	26 00	34	37
Pedlar . . .	England, 20th	13	16 00	19 00	21 00	22 00	23 00	14 00	18 00	47	50
Charles . . .	Liverp'l, 4th	12	19 00	21 00	24 00	26 00	25 00	21 00	24 00	31	34
Horatio . . .	" 2d	15	18 00	21 00	21 00	21 00	20 00	23 00	26 00	35	38
Means . . .		14.2	19.1	21.7	23.7	24.4	23.2	20.5	23.8	39.1	42.5
	JULY.										
Vernon . . .	Liverp'l, 26th	12	22 00	23 00	25 00	25 00	23 00	18 00	24 00	32	36
Akbar . . .	" 20th	9	21 00	23 00	25 00	26 00	24 00	17 00	26 00	27	30
Isabella . . .	" 17th	12	19 00	20 00	20 00	21 00	21 00	18 00	24 00	35	39
Phœnix . . .	Gibraltar, 2d	5	15 00	21 00	23 00	25 00	24 00	21 00	26 00	33	37
Two Brothers .	" 18th	4	17 00	18 00	20 00	19 00	20 00	17 00	20 00	42	47
Owen Glendower	London, 27th	11	18 00	24 00	26 00	28 00	26 00	18 00	22 00	33	36
Paulista . . .	Havre, 11th	9	21 00	25 00	27 00	29 00	27 00	23 00	28 00	28	30
Miltiades . .	Liverp'l, 8th	14	17 00	19 00	21 00	22 00	21 00	18 00	21 00	42	46
Borneo . . .	Gibraltar, 26th	6	19 00	22 00	26 00	27 00	26 00	17 00	19 00	33	36
Means . . .		9.1	18.8	21.6	23.6	24.6	23.5	18.5	23.3	34	37.4
	AUGUST.										
Aquetnet . .	Liverp'l, 1st	13	19 00	20 00	23 00	24 00	22 00	16 00	22 00	39	42
Letitia . . .	England, 14th	9	20 00	23 00	25 00	26 00	25 00	23 00	27 00	30	33
Phœnix . . .	" 5th	9	19 00	21 00	24 00	24 00	20 00	13 00	19 00	29	32
Elizabeth . .	London, 12th	17	19 00	21 00	24 00	25 00	24 00	20 00	21 00	49	52
Columbia . .	England, 27th	20	21 00	22 00	22 00	23 00	23 00	15 00	17 00	58	62
Inca	London, 1st	12	17 00	21 00	25 00	26 00	24 00	20 00	27 00	31	34
Restitution . .	Gibraltar, 10th	5	19 00	21 00	24 00	25 00	23 00	18 00	21 00	25	28
Means . . .		12.1	19.1	21.2	23.8	24.7	23.0	18.0	20.6	37.3	40.4

Crossings from Europe to the Parallel of St. Roque—Continued.

NAME OF VESSEL.	SAILED FROM.	DAYS FROM EUROPE TO 30° N.	LONGITUDE OF CROSSING PARALLELS OF— 30° N.	25° N.	20° N.	15° N.	10° N.	5° N.	CROSSED EQUATOR. Long. W.	CROSSED EQUATOR. Days.	PASSED ST. ROQUE. Days.
			Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.			
	SEPTEMBER.										
Margaret . .	Havre, 1st	18	18°00′	21°00′	23°00′	25°00′	23°00′	16°00′	19°00′	42	45
Restitution . .	" 8th	11	19 00	21 00	24 00	25 00	24 00	21 00	21 00	32	35
Mariposa . .	England, 5th	12	20 00	22 00	24 00	26 00	24 00	17 00	20 00	36	40
Caroline Read .	Liverp'l, 12th	12	20 00	23 00	25 00	26 00	25 00	21 00	25 00	38	40
Robertina . .	Glasgow, 11th	16	17 00	20 00	24 00	26 00	25 00	19 00	20 00	47	52
Restitution . .	Havre, 3d	14	19 00	21 00	24 00	27 00	24 00	21 00	20 00	38	41
Restitution . .	England, 25th	9	17 00	20 00	22 00	22 00	21 00	21 00	25 00	25	28
Colcord . . .	London, 14th	12	18 00	21 00	23 00	26 00	26 00	25 00	24 00	35	38
Means . . .		14.2	18.5	21.1	23.6	25.4	24.0	20.1	21.7	36.6	39.9
	OCTOBER.										
Coriolanus . .	Liverp'l, 27th	13	24 00	24 00	25 00	25 00	25 00	24 00	26 00	34	37
Montevideo . .	Cadiz, 25th	10	16 00	22 00	25 00	26 00	25 00	24 00	28 00	27	30
Boston . . .	London, 11th	17	28 00	32 00	32 00	30 00	26 00	22 00	25 00	39	42
Narraganset .	Liverp'l, 7th	7	22 00	25 00	26 00	27 00	24 00	23 00	24 00	22	25
Albion . . .	" 24th	16	22 00	24 00	25 00	25 00	21 00	21 00	21 00	37	40
M. Forbes . .	London, 7th	18	19 00	22 00	21 00	22 00	23 00	21 00	24 00	45	48
Rosario . . .	Gibraltar, 10th	9	17 00	21 00	23 00	25 00	24 00	24 00	20 00	32	35
Scotia . . .	London, 1st	7	18 00	18 00	19 00	20 00	21 00	18 00	16 00	35	38
Commodore . .	" 10th	10	18 00	22 00	24 00	25 00	24 00	24 00	29 00	29	32
T. Arbuthnot .	England, 5th	10	18 00	21 00	20 00	20 00	20 00	21 00	25 00	33	36
Realm . . .	Cadiz, 9th	4	15 00	21 00	24 00	26 00	26 00	27 00	29 00	35	38
Means . . .		11.0	19.7	22.9	24.0	24.6	23.5	22.6	24.3	33.5	36.5
	NOVEMBER.										
Belochee . . .	Liverp'l, 15th	9	18 00	23 00	20 00	20 00	19 00	18 00	17 00	30	33
S. Luman . .	England, 29th	16	18 00	20 00	21 00	21 00	21 00	20 00	22 00	34	37
Brooklyn . .	Liverp'l, 12th	14	22 00	24 00	26 00	26 00	24 00	21 00	22 00	33	36
Warsaw . . .	England, 6th	17	21 00	24 00	24 00	26 00	24 00	21 00	23 00	32	35
Earnestine . .	Liverp'l, 1st	16	18 00	20 00	24 00	26 00	24 00	26 00	27 00	37	41
Means . . .		14.4	19.4	22.2	23.0	23.8	22.4	21.2	22.2	33.2	36.4
	DECEMBER.										
S. Brewer . .	Lisbon, 23d	4	18 00	21 00	24 00	25 00	25 00	23 00	27 00	20	24
Eliza	England, 16th	9	19 00	25 00	25 00	25 00	23 00	21 00	25 00	32	37
Mary	Lisbon, 22d	15	16 00	21 00	23 00	25 00	22 00	20 00	18 00	35	41
Scotia . . .	London, 30th	10	18 00	18 00	19 00	19 00	19 00	15 00	15 00	35	40
Jenny Pitts . .	England, 14th	12	18 00	18 00	23 00	22 00	23 00	25 00	27 00	33	36
Leontine . . .	Lisbon, 7th	6	16 00	17 00	20 00	22 00	22 00	22 00	26 00	25	29
Stornaway . .	Liverp'l, 27th	10	17 00	19 00	20 00	21 00	22 00	22 00	23 00	30	33
Geneva . . .	Havre, 1st	16	19 00	20 00	20 00	20 00	20 00	20 00	24 00	51	55
Means . . .		10.2	17.6	19.9	21.5	22.4	22.0	21.0	23.1	32.8	36.8

Now upon an analysis of these tables, we find what the Pilot Charts might have induced us to expect, viz: the closer in shore, the longer the average passage to the line. The analysis gives the average time to the equator from the several crossings of lat. 30°, as follows:

East of 16°	24	days	from	the	mean	of	6
Between long. 16° and 17°	23	"	"	"	"	"	6
" " 17° and 18°	24	"	"	"	"	"	14
" " 18° and 19°	24	"	"	"	"	"	22
" " 19° and 20°	23	"	"	"	"	"	19
" " 20° and 21°	22	"	"	"	"	"	6
" " 21° and 22°	21	"	"	"	"	"	7
" " 22° and 23°	18	"	"	"	"	"	6

Thus, as the place of crossing the parallel of 30° is farther and farther to the west, so is the average passage thence to the equator diminished. East of the meridian of 19°, the average passage, as far as the data of these tables may be relied on, is about 24 days. To the west of 19°, the ratio of decrease as to length of passage, according to this showing, is most rapid.

Now the winds along this route are an exact counterpart of those that are found in the Pacific, on the route from California to Peru, Chili, or Cape Horn: for the deserts of Mexico and the United States hold very nearly the same relation to the N. E. trade-winds of the Pacific, that the deserts of Africa do to those of the Atlantic; and though quick runs may be made now and then, both along the west American and west African coast, yet in the long run, experience in the Pacific has amply proved that the navigator saves time by keeping off from the coast, and so I apprehend it will be here. Indeed, experience in the Atlantic goes directly to show the same thing, and to place the opinion almost out of the category of conjecture, for this is the very point upon which the advantages of the new route from the United States to the line are based.

The passage to the line from England and the English Channel ought not, on the average, to be as long by several days as it is from the United States. In the first place, the distance from the Land's End is not so great by two or three days' sail; and, in the next place, the winds are fairer. Vessels bound to the line from any of the Atlantic ports of this country, have to sail close hauled most of the way, but from Europe they go free.

If the performance of the ships whose abstract logs I have, and which furnish the data for these tables, be a fair specimen of what ships generally do on this route, and I suppose it is rather above than below, it would appear that the average passage the year round to the line from England and the English Channel is 36 days; the months giving the longest averages, such as they are, being January and March 47 days, August 46, and June 39. The first two are evidently too long, their averages being determined from only two or three passages each. The average to the line from the United States has been brought down from 41 to 31 days; and the average from the British Isles and English Channel can be, I am encouraged to believe, reduced to less than the American average; and the observation, to be contained in the abstract logs that shall be kept for us during the next year or two will, probably, enable us to decide this question.

In the mean time, the route which I venture to recommend—not, however, without some misgivings arising from the want of more ample data—is the same, very nearly, for all vessels from whatever part of Europe.

They should aim, whenever the wind will allow the option, to cross the parallel of 30° N., between the meridians of 25° and 30° W., but should not contend with adverse winds for it; having reached this crossing, their course thence is due south for the line, between the same meridians. In summer and fall, they should enter the southern hemisphere about the meridian of 30°, but during the rest of the year, they will generally not be forced so far over to the west, though they should not care to go east of long. 25°.

Vessels from as far north as the English Channel, should aim to cross the parallel of 40°, between the meridians of 20° and 25°; and, for this reason—besides that of winds a little more propitious—viz: In crossing the calms of Cancer, the navigator wants to be in such a position, that he may always be able to go on that tack which will carry him most rapidly across this belt of calms. In other words, he wants to be in that position where it is immaterial to him whether he be making easting or westing, provided he be on the tack which will give him the most southing. For this reason, he should aim to enter the calm belt between long. 25° and 30° W.

The average crossing place of 30°, at present, is about the meridian of 19° W.

Navigators, wishing to try the more westerly route, are referred to what is said under the head of the route to Rio, p. 324 *et seq.*, for their guidance through the equatorial doldrums and other calm belts, at the various seasons of the year.

There is room, also, for the gain of a day or two, from the line to Europe on the return voyage. On this voyage, vessels aim to cross the equator too far east, where they are so very liable to be baffled by calms and light winds. It is the passage over again, so far as the winds are concerned, from the line in the Pacific to California.

There is, especially for emigrant ships to Australia, another recommendation in favor of what may be called this western route from Europe; this recommendation consists in better weather, and more healthful breezes, especially in the region of the equatorial doldrums, where the weather, even in January, is so singularly sultry and oppressive. The account given of it, by Com. Sinclair, p. 59, is graphic and true. I have the abstract log of an emigrant ship, from England to Australia a year or two ago, by which it appears that she lost in these doldrums no less than thirteen of her passengers. They were healthy until the vessel reached this region, and they were again healthy for the rest of the voyage after crossing it. I notice an entry in the log, made a day or two after getting clear of this almost *steaming* heat, this damp belt of perpetual calms, and ceaseless rains, "sick recovering fast." The women and children were the principal sufferers. This calm belt to the east of long. 25°, may be considered as the burial place on the wayside from Europe to the other hemisphere. To the west of this meridian, this belt is neither as broad nor as difficult to pass; consequently, both time and health invite navigators to pass it west of long. 25°. The Trade-Wind Chart, and the Pilot Charts together, afford all the information that the navigator can desire, concerning the winds and the calm places along the routes between the meridians of 25° and 30° W., from the parallel of 30° north to the equator. My logs show, that vessels which cross the equator to the east of 25°, are frequently baffled by these doldrums, for three weeks or more at a

time. The average time of crossing these, is from a week or ten days, to the east of 25°; and from three to four west of that meridian. The shape of the belt is cuneiform, with its base towards the African Coast. The Trade-Wind Chart shows the navigator, at a glance, the parallels between which he may expect to lose the northeast trades, and enter those calms every month in the year.

Attention to that Chart, and to what has been said under "ROUTES TO RIO," p. 324, about the calm belts, the trades, and crossing the line, and the influence of the African Desert upon the winds at sea, will enable intelligent shipmasters to follow this route from Europe without farther directions.

OF THE PASSAGE AROUND CAPE HORN.

The force engaged upon the Charts at the Observatory has been so much interrupted, that I have not yet had time to discuss the Cape Horn route, according to the method used for discussing the best routes to the line. Pilot Charts from 50° S. to 62° S., and from 55° W. to 91° W., on a scale of 1° lat. 2° long., have been published, to aid navigators in their Cape Horn perplexities. A careful study of these Charts is necessary to a proper knowledge of this passage. The first injunction, therefore, in a set of Sailing Directions for doubling Cape Horn, is to consult, whenever the winds are adverse, the Cape Horn Pilot Charts.

Vessels bound round the Cape should first, however, after leaving Cape St. Roque, aim, if the winds will let them, to cross 25° S. in about 35° W. At any rate, as far off from the land as, with a good clean rapfull, they can without going to the east of 33° or 34°.

After passing the parallel of Cape Frio, they should make the best of their way south, aiming always to pass *inside* of the Falkland Islands, and, if wind and daylight serve, through the Straits of Le Maire.

The reason for this recommendation is this: After crossing the parallel of Tierra del Fuego, the difficulty is to get to the westward. Therefore, it is better to make westing on this side, when it is practicable, and where the weather is mild, than to put it off for the stormy latitudes, where it is more difficult.

Captain Smyley, who has been engaged for many years in the seal fishery of the South Seas, has furnished me with some remarks and sailing directions in relation to this part of the ocean; so also have Captain Bryson, and others; navigators may find these remarks useful; I therefore copy them.

From Captain Leslie Bryson, of the Brig Daniel, to Lieut. M. F. Maury.

In compliance with your published request, I avail myself of the earliest opportunity to forward to you an abstract journal of the brig Daniel, formerly the United States bomb brig Hecla, kept by me on her voyage from New York to California, which is but a poor tribute for the manifest advantage and valuable knowledge imparted by the aid of your truly useful and ingenious system, which I regard as one of the most valuable inventions of the age, and doubtless will yet lead to results, far beyond its present apparent purpose, to speed the voyage.

Noticing your intimation to West India traders for farther data, to complete your Wind and Current Chart of the West Indies, I have written a friend to send you my private journals, embracing a period of about six years, commencing May, 1838. These journals were kept for the purpose of facilitating a practical knowledge of winds, &c., for which I thirsted, without the means of obtaining any reliable information, except the divers accounts furnished by casual observers, which, like the various sailing directions for Cape Horn, serve rather to distract the mind than to assist the judgment. I was in the constant habit for several years of referring to these journals, with the sole view of obtaining the very information that your Charts so plainly and beautifully illustrate. My personal observation, therefore, confirms me in the truth of your system. Having been kept solely for private use, you will find many remarks in those journals quite irrelevant to your purpose; nevertheless, in your hands, I trust they will be acceptable. The temperature of the air and water was only noted in approaching and departing from our coast. At different times, I have found a cold place in the centre of the gulf, bearing about S. E. by S. from Montauk. I do not know whether the remark is noted in my journals, but I am certain of the fact.

The currents may not always have been regularly noted, except when unusually strong. In reference to my present passage, I would state that I followed your directions, as near as winds would permit. Although the vessel was deep, and sailed heavy, I have reason to think our passage was thus materially shortened.

About the parallel of 45° S. a marked change in the weather occurred, followed by a constant succession of gales. The temperature of the sea had also suddenly fallen some 6° below the temperature of the air, as indicated by the thermometer attached to the barometer in the cabin. The difference of temperature between the air and the water continued with little variation until we passed the cape, except a part of the 14th, 15th, and 16th of February, when we stood far enough eastward to bring Falkland Islands in a line with Cape Horn. At those times, the temperature of the sea rose to about the same range as the air; from that circumstance, in connection with the N. E. current, I was strongly impressed with the idea that a steady cold stream set to the northward and eastward, like the Gulf Stream on our coast, the elements being only reversed, which would account for the continual storms that seem to prevail in that region.

The current continued more or less strong in proportion to the strength and duration of the gales; but varying more easterly as we drew up with the Horn, until we were fairly past it, and nearly up with the latitude of Cape Pilar, amounting to no less than 650 miles! Considering this great drawback in connection with the almost constant adverse gales, many of which were so heavy that no ship could bear canvas, it seems highly important to ascertain the most desirable route, if possible, to avoid such serious dangers and delays. It was my intention to have doubled the cape close, and keep near the land all the way round. But after making Diegos, the violence of the gale seemed to render it a matter of prudence to keep an offing; then there was difficulty in making northing without also making much easting. When we finally succeeded in again attaining the latitude of the Horn, the gales were not so furious but that we could carry close-reef topsails. The second day after our departure from Diegos, the current had set us so far to the E.,

I could not believe my chronometer, and supposed I might have inadvertently stopped her 10′, which I deducted in order to make our position where I wished it to be. I continued to work time every day when an opportunity offered, and seldom missed a day, considering the dreadful weather. Arriving at Juan Fernandez, I found my chronometer perfectly correct, and have since corrected the longitude for the 10′ subtracted. I mention the above to show that you may rely upon my observations upon the currents, &c., with more accuracy than is usually bestowed by merchantmen. Adverting to the winds of Cape Horn, I would state that I projected wind circles like yours on the margin of your Chart of Tracks for the cape. The result led me to expect S. W. and N. W. as the prevailing winds for the months of February and March; but it was our hard fate to find them from W. S. W. to W. N. W. per compass. I contemplate making the voyage round *via* China. If so, shall continue the abstract, with such remarks on the movement of the elements and natural phenomena as may come within the range of my observation.

From Captain Smyley to the same.

In looking over your valuable Sailing Directions and Charts, which I consider the best guides ever given to the navigator, in pointing out the means of shortening the passage to his port, as well as shunning the calms, which have caused so much detention in vessels crossing the line, and also of the advantages taken by standing more to the westward, and passing nearer Cape St. Roque. I have tried both routes to my own satisfaction, and am well satisfied on my own part that the western route is far the best, and have for several years recommended it to be taken, and I am happy to say I have been since told by many that it is the most preferable.

I sailed from Newport, R.I., July 3, 1836, in the schooner Sailor's Return—myself master—bound to the Falkland Islands and South Shetlands. The schooner Geneva, Captain A. Padack, my consort, sailed the same day, and kept company with me until we arrived in the latitude of 4° N. and 25° W. The winds were light and baffling, from S. W. to S. S. W. for one or two days. I stood to the westward, but *he* began to worry for fear of falling to the leeward. I left him, giving him instructions to proceed with all possible dispatch, and meet me at the Falkland Islands; we were then in 4° 16′ N., and 26° W., wind S. S. W. The Geneva stood on her eastern tack, *I* to the westward, and arrived at the Falkland Islands twenty-one days before her.

On examining our journal, I found I gained thirteen days of the time between 4° N. and 8° S., by nothing but his being afraid of falling to leeward; whilst I could lay the land along, he was continually tacking about; and as for a current, I tried several times, and found but very little setting N. W. There was the schooner Ann Howard, of New London, had the same passage as the Geneva, and took the same route; she had eighty-one days to the coast of Patagonia, and eighty-three to Port Desire, latitude 47° 45′ S.; longitude 65° 54′ W. The A. H. sailed within one day of the Geneva, and arrived within two days of her, giving me twenty days ahead of one, and twenty-three ahead of the other.

Sailor's Return, a second voyage, sailed 22d August, 1838; and in thirty days was cast away at Cape St. Roque, standing along shore on the off-shore tack, having made the land that morning. I was bound

in, to Rio Grande, north, to repair my sheathing, which had started off the bottom. I crossed the line in 35° 40′; I found no trouble in getting up the coast, until I struck on the reef at Cape St. Roque.

I found the tides tolerably regular at the cape during the two days I was on shore, and the pilots say the currents are trifling on the coast from St. Roque to St. Augustine, when you are in more than forty fathoms water; and I believe it is true, for I have tried it since, and found very little, if any.

Schooner Benjamin De Wolf, W. H. Smyley, master, sailed from Newport, R. I., for the Falkland Islands, 2d of April, 1839. Having a sharp vessel, and every confidence in my own mind of the western route, I determined to steer my course as if bound to Fernando de Noronha, and to pay no attention either to winds, weather, or currents, no more than if such were not to be found on the route. I found no calms, and but little rain. I passed inside of Fernando de Noronha, distant twelve or fifteen miles, and passed Olinda in twenty-one days and eight hours; and from St. Augustine to Port Egmont, I had but twenty days—making but forty-one days and eight hours passage to the Falklands.

Schooner Benjamin de Wolf, second voyage, W. H. Smyley, master, sailed from Newport, R. I., 28th May, 1840, for Patagonia, and arrived at Rio Negro, latitude 41° 4′ S., longitude 62° 49′ W., in forty-one days, passing about fifty-five miles east of Fernando de Noronha, and crossing the line in 36° 15′. I found the wind from N. W. to S. W., more than from any other quarter, from the line to St. Roque. The current I had no opportunity to try, but am sure it is more governed by the wind than anything else, but far less than people in general suppose.

Schooner, Ohio, W. H. Smyley, master, from Newport, R. I., to Rio Negro, Patagonia, sailed September 29, 1842, in company with the Sarah Ann, Gough, master—consort to the Ohio; kept company until in 16° north and 40° west. Captain Gough, as well as Padack, wished to cross the line well to eastward, and, although they were both under my instructions and control, I permitted them to have their choice. After leaving Captain Gough, I steered for Fernando de Noronha, as before, but kept on until I found myself in sight of Cape St. Roque, passing inside of the Rocas, ten miles, and by making a short tack off Mernanguapa, passed Pernambuco, distant about eight miles, being then out thirty days. I stopped three days at San Francisco, and three at Isapacaray, making my passage to Rio Negro in sixty days including stoppages.

The Sarah Ann made no stoppages, and came in ten days after me, making my passage sixteen days shorter than hers, exclusive of being embayed two days. I found by overhauling their journal and log, that they kept well to the eastward in that old *beaten turnpike* of former navigators, crossing in from 24° to 25° W., and that most of my gaining was from about 4° N. to 8° S., which convinced me of the advantages of the western route.

Schooner Ohio, first voyage, W. H. Smyley, master, sailed from Newport, R. I., July 14, 1841—making my passage in fifty days, including two days' stoppage at the Brazils for recruits. I passed so close to the Rocas, and not being able to get good observations, owing to the weather, that I am not sure which side I went on.

On my arrival in the Brazils, I tried my chronometer, by artificial horizon, and found it correct. It

was in the daytime, and I kept a good look-out for them, until I was sure I was to the south of them. This voyage I had no consort; I found but little current setting W. N. W.; this was near the Rocas, perhaps one degree, or a little more, north of them.

There is another thing still more remarkable; although you have more wind near the land, yet the sea is much smoother than it is further to the eastward. The natives who fish on the catamarans along the coast, have repeatedly told me that the current was but trifling; you will often see two of these catamarans at anchor, tailing in different directions, but generally with the wind. If the current about Cape St. Roque was as strong as persons in general imagine it to be, the clump-built coasters would not be able to make headway, and beat from ——— up to Pernambuco, at all seasons of the year, as they do.

Schooner Catharine, of Newport, W. H. Smyley, master, bound to Patagonia. I left Newport, September 10, 1845, and stood to sea, with the intention of taking my old route, that is, to steer for Fernando de Noronha, or nearly that course, so as to pass east of the Bermudas, but the wind prevailing more to the south, gave me a chance to keep well to the eastward. I stood boldly on; but had the wind light, with heavy rain squalls, and much thunder and lightning; crossed the line in 23° 32′, making little headway, having light airs and a very irregular sea. Although I found so much rain and light winds, the sea did not seem to fall in the least, causing the vessel to thresh heavily, and be very uneasy. I spoke a brig, which had been eight days longer than myself in these rainy regions, and off Pernambuco I spoke one which had been ten days less, being to the westward of me. I was forty-five days to Olinda, and twenty days from there to Rio Negro, Patagonia; and I fully believe, if I had taken the western route, I should have made a very short passage, as the vessel sailed very fast, was in good trim, and well manned.

Pilot-boat John E. Davidson, W. H. Smyley master, from New York, towards coast of Patagonia, sailed July 5, 1849.

July 6. - -	The Hook and Light-house in sight.			
7. - -	Wind W. S. W.	Latitude 38° 43′ N.	Longitude none.	True Longitude.
8. - -	Wind light S. E.	" 38 31	" none.	
9. - -	" S. S. E. and S. E.	" 38 14	" none.	
10. - -	" S. S. E. and calm.	" 38 03	" none.	
11. - -	" Calm.	" 38 00	" none.	
12. - -	" North.	" 35 07	" 66° 53′	59° 07′
13. - -	" S. W. and calm.	" 35 04	" 65 02	
14. - -	" South.	" 34 48	" 63 32	
15. - -	" South.	" 34 29	" 61 23	47 40
16. - -	" Variable	" 33 38	" 60 52*	

* Note.—The above is taken from the log-book of the mate; the winds and latitudes are put down correctly, but the longitude is 13° 15′ out of the way. I merely put down this to show you how erroneous some persons will be. I gave him his longitude on the 16th, when I spoke a vessel whose longitude agreed with mine within four miles, but, in crossing the line, he was almost as *far out* again. I

Homeward passages in the above-mentioned vessels.	Days.	Hours.
Sailor's Return, from Rio Grande to Newport	27	4
Benjamin DeWolf, first voyage, arrived from Morea Mernanguapa . .	26	
" " second voyage, arrived in March from Morea Mernanguapa	30	
Ohio, from Rio Janeiro to New York	34	
John E. Davidson, Rio Negro to New York	39	16

In these five passages, after passing Cape St. Roque, I have kept "good full;" and always found, as I neared the West India Islands, that the wind hauled favorably, and the weather became less squally.

Mernanguapa is a small port near Parahiba.—See Chart.

There are few portions of the continent of America less known than from the Rio de la Plata to Cape Horn, and none of more importance; the whole of that portion of country, except part of Belgranna and Rio Negro, being inhabited only by Indians. It has been the custom of vessels bound to the Pacific, after passing the La Plata, to go to the eastward of the Falkland Islands; some wishing to avoid running by La Agle shoal, others fearing to get *jammed* on the coast of Patagonia. This should no longer be an excuse; for the first does not exist, and of the latter there is no danger. I have cruised for the above-mentioned shoal several times, taking a good departure from the Jasans and from New Island in the Falklands, and crossed to Cape Virginis and back in the long summer days, seeing no signs of it. In 1842, I left East Harbor, Staten Land, with my consort in company, and steered for the shoal, keeping about eight miles apart; the weather was clear. I kept men at the mast heads, and saw nothing of it. My observations were to be relied upon; for I had on board three chronometers, which had been well proved at Cape St. John. I kept on for Rio Negro, and on my arrival again tried my chronometers, and found them correct. I am well aware that no such shoal exists. I have since then tried to find it with the schooner, but without success. The Beagle and Adventure, and Captain Sullivan of the navy, have also hunted for this shoal without finding it.

As for a vessel getting blown on shore on the coast of Patagonia by N. E. gales, it is out of the question. I have spent twenty-two years of my life mostly from South Shetlands to the River La Plata, and once I remained six years without coming north of 41 S., and I cannot say that I ever knew, during that

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crossed the line in 34° 15′ on the 5th of August, and on the 7th passed ten miles west of Fernando de Noronha, the weather clear, the island plainly in sight. On the 9th, passed Pernambuco; I found no trouble in getting to the southward. It was my intention to have stopped at Pernambuco, for the purpose of landing some of my crew, who had mutinied on the passage, nearly killing my mate, and shooting me with a pistol. Their attempt to take the vessel left me without a sufficient number of men to work her, which caused my passage to be much longer than it otherwise would have been. I kept but little reckoning afterwards, and that mostly in my head, for fear of another mutiny, for the crew shipped in New York for the purpose of taking the vessel, and nearly succeeded in doing so. The weather being squally off Pernambuco, I kept on for St. Catharine's, and arrived there on the 22d of August; on the 23d or 24th, gave my men up to the U. S. Consul; on the 7th of September, got under way from St. Catharine's; and on the 16th, anchored on the bar off Rio Negro, Patagonia.

Giving me 30 days to the line.
47 days to St. Catharine's.
56 days to Rio Negro.

time, the wind to blow heavily directly on shore for twelve hours. My voyages being principally made for sealing or whaling, caused me to keep close into the coast, whereby I had the best opportunities for observing the weather, currents, tides, &c.; in fact, my voyages depended partly on these, and it stood me in hand to make myself acquainted with them.

I have always found that the sooner I got to the westward, after crossing the line, the better. I always try to make the Peninsula of St. Joseph's, between New Bay and Port Valdez. The land is high, steep, clay cliffs, flat on top. Then, I endeavor to keep near enough to see the land until I get well to the south, so as to pass close by Staten Land; by doing this, I have smooth water, winds from N. W. to W. N. W., and pleasant weather; while another vessel will have the wind from W. N. W., and S. W. off the Falkland Islands, and on the south side of the islands the wind will be from S. W. to S. This I have proved by having left men on the Jasans and the Bushenes (these being the extremes of the islands, both sealing grounds), and requiring them to keep a journal of wind and weather. I found the wind to prevail much more from the S. W. and S. S. W., about one-third or one-half way between Cape Horn and ——, and beyond that distance it drew more to the westward, and even to the northward of west. It was a common thing, while at anchor under Diego Ramirez, or sealing on shore, to see a vessel pass in shore of the island heading up two points higher than an another vessel off shore off them; and I have often started to go in to anchor, heading well up for the place I wanted to come to at, and found, as I drew in shore, the wind gradually headed me off. When bound to Shetlands from the Cape, or from Staten Land (Shetland is our rendezvous, on account of getting wood there to last until our return), we always find, after passing the latitude 60 S., the weather much milder, fewer blows, but more fog. The currents as well as the winds are generally the reverse of what they are off Cape Horn. The prevailing wind at Shetland is N. E., while in the track generally taken by vessels it is S. W. The current is similar, for it seems more like a gulf stream than a common current following the direction of the wind.

No navigator should be afraid to approach the coast. Soundings are found far out; the water is much discolored, as the land is neared; and we have another sign, which seldom fails in the daytime, *i. e.* the small gulls, which will always be found in forty or fifty miles of the coast, making their presence known by the noise they make as soon as the vessel is perceived. This seldom fails to be the case.

The navigator should not be backward in tacking as soon as he finds himself getting off shore, for the wind will often lead him along for two or three points, and then favor him for a short distance again, by which means vessels often get so far to the eastward as to lose much time. I would always recommend a ship to tack in shore, even if she could make no better than a W. N. W. course, in preference to going to the eastward; for by keeping well in, she will have smooth water, clear weather, and wind more off shore. While, on the other hand, when she nears the Falklands, she would begin to have fogs, rain, and sleet; and south of the islands the rain becomes hail-stones and snow. A short distance in these latitudes makes a great difference in wind, weather, and tides.

For comparison, take Santa Cruz harbor, on the coast of Patagonia, latitude 50° 8′ S.; longitude 68° 21′ W.; tide in spring, forty-eight feet. The Jasan Islands, belonging to the Falklands, latitude 51° S.,

longitude 61° 20′ W.; tide but six feet. Here is a great difference in 7° of longitude, about 260 true miles. This will show the extraordinary difference made in tides by a short distance, and the weather in proportion to the tides; on the one it is seldom known to rain, at the other it rains half the time. At the Straits of Magellan, in a similar way; it seldom rains at the eastern entrance, and at the western it seldom stops; but this is owing more to the mountains leading from Cape Forward along the straits, and from thence to Cape Tres Montes, or Chili.

Hereabouts, we have but little thunder and lightning, but one may be on a hill above the rain, while those below have a heavy storm; I have seen this occur on Staten Land, also on Juan Fernandez and Massafuera.

Temperature in high southern latitudes differs greatly from temperature in northern; in southern latitudes there seems to be no extremes of heat and cold as at the north.

Newport, for instance, latitude 41° N., longitude 71° W., and Rio Negro, latitude 41° S., longitude 63° W., as a comparison.

In the former, the cattle have to be salted and fed during the winter, not being able to get along in the fields on account of snow and ice.

In the latter, the cattle feed in the fields all the winter, there being plenty of vegetation, and no use for hay.

On the Falkland Islands, thousands of bullocks, sheep, and horses, are running wild in the country, getting a living all through the winter. This could not be in similar northern latitudes.

On the other hand, in the latitude of 50° to 51° N., rye, barley, wheat, &c., can be raised during the summer, but in south latitude there is not sufficient heat in the summer to bring such things to maturity, for, even in the depth of summer, you would be liable to snow squalls. After passing the latitude of 40° S., the summer is not so warm, and the winter not so cold, as in northern latitudes.

You can see, by reference to the book published by Commodore Wilkes, that the extreme cold had but in one instance been as low as 5° below zero. This I ascertained from a self-regulating thermometer, in latitude 63°, and gave him. Since that time, it has never been so low. The heat I could not ascertain, as the index in the tube shifted while I was lifting the instrument up. I tried to procure one some time ago in New York, but could not find one. I intended to have placed it in a much higher latitude, as very little is known about either extreme of temperature on the land. For instance, many suppose that Palmer's Land is a continent, and connects with the land laid down by Wilkes; however, this is not the case, for I have sailed round Palmer's Land and far south of it. * * * * * * * *

Owing partly to negligence and partly to disasters, I have no logs or books which will be of use to you. But I will try this cruise to send you some; and if you know of anything particular from the La Plata, to as far as 70° S., I may be able to give you some information, for to that place I have given most of my attention, as my business has been there during the greater part of the time.

While I was at this book, it occurred to me to send some leaves out of a scratch-book, which might be of some use in showing tides, harbors, &c., so I tore them out and send them to you. I have done this

very hastily, and in a most bungling manner, but I did not know that I would have to go away so soon, and would not be able to finish. So I have driven ahead and done what I could.

If you choose, I will distribute those Charts to men who I know will take care to return the journal to you, on their return home, for I consider them to be a benefit to all seafaring men.

From Capt. Ebenezer H. Linnell.

San Francisco, 1854.

Dear Sir: I herewith enclose the abstract log of the ship Eagle Wing, from Boston to this port.

This being my first acquaintance of your Charts and Directions, in regard to the observations of the North and South Atlantic, I can add nothing. After leaving Boston, my progress was considerably retarded in consequence of loss of spars. I think the Straits of Le Maire should be passed near to Terra del Fuego shore, and continue the shore until well to the west; by so doing, I have found an eddy current to the west; this being the fifth time I have found this to be the case. Since 1845, I have been navigating these waters, mostly in the Chili trade, and I am confident that my passages have been shortened by keeping near the land. When to the west of the Straits of Magellan, I think you will eventually find that by keeping from 60 or 100 miles from the coast until you approach the 35° of latitude, then to pass near to Juan Fernandez to the S. E. trades, for the six summer months; then, for the winter months, a direct course a little to the west, you will find favorable winds. In July 21, 1851, I passed through the Straits of Le Maire; passed the equator in 115° W., in 26 days, by the western route. In October, 1852, in 27 days from the Straits of Le Maire, and passed the equator in 116° W. per ship Buena Vista, being a full ship.

The present time, my ship being a clipper, you will perceive that I did not have so favorable a time. I have had, from 18° north to this port, a very perplexing time; you will notice that when in 18° north, my chance was good for 95 days.

I trust the time is not far distant when this part of the ocean (North and South Pacific) will be tested and fully explained, as your Wind and Current Charts fully show the great advantages of this scientific undertaking.

The opinions expressed by these navigators as to the passage to the line, and the Cape Horn route, are fully confirmed by the Pilot Charts; and though sometimes a vessel, by going to the east of the Falkland Islands, may have good luck, fine weather, good winds, and a short passage, it should be considered as the exception, but by no means as the rule. The combined experience of all the Cape Horn navigators, whose journals have been consulted during the progress of my investigations, is against the eastern, and in favor of the western, or in-shore passage, as a general rule.

I find in the abstract log of the ship Defiance (Robt. McCerran), the following excellent remarks, concerning this passage:—

September 26, 1852. At 4 hours 30 min. A. M. hove to for daylight. At 8 hours 30 min. A. M.

entered the Straits of Le Maire; wind at N. N. E. At 10 A. M. Cape St. Diego bore west per compass, and Staten Land S. E., entirely covered with snow. At 11 hours 30 min. clear of the strait. I am surprised that this strait is not passed by all ships in preference to passing east of Staten Land; Le Maire being free from shoals, and 14 miles wide. An experience of 21 years' command in the Liverpool trade convinces me that the passage between Tuskar and the Smalls are trebly dangerous, and I can see no difficulty in this passage that is not much greater in the navigation of the Irish Channel, either north or south about.

I should certainly beat through in preference to going within three miles of the land. I have no doubt that an eddy from eastward—I found a current close in shore setting S. W., and by keeping the current from the S. W.—must prevail under any circumstances. Good Success Bay affords easy access and good anchorage. It may be said that heavy gales ahead, and thick weather, make the passage dangerous. In answer I say, that it cannot blow harder than it does in the Irish Channel, and the fog cannot be so dense as it is on the coast of Ireland, as the water is deeper and the air colder in Le Maire. Besides, the number of vessels on the Irish coast increases the danger by the chance of collision, and there is no other passage to approach.

Ship Defiance (Robert McCerran), from New York to San Francisco.

Aug. 3, 1852. Lat. 6° 14′ S.; long. 34° 39′ W. Current, 31 miles, S. W. ½ S. Barometer, 30.00; temperature of air, 78°; of water, 80°. Winds: S. S. E., S. E., S. by E. Made the land 60 miles south of St. Roque; too far E., 15 miles. I am satisfied that the Sailing Directions of Lieut. Maury have thus far shortened my passage, and this abstract proves that; though I was forced as far W. as 40° 30′, when in 11° 30′ N., yet, by watching chances, I was enabled to cross the line in 31° 55′ W. without making northing over 30 miles; and though under anxiety on account of the bugbear of westerly current, I did not find it but *one* day, and generally on the current track I found a S. E. set.

Sept. 29. Lat. 56° 14′ S.; long. 71° 01′ W. Barometer, 29.8; temperature of air, 41°; of water, 44°. Winds: W. by S., W. S. W., W. Fresh gales and squally, with heavy sea.

Sept. 30. Lat. 56° 11′ S.; long. 71° 26′ W. Barometer, 29.7; temperature of air, 43°; of water, 44°. Winds: W. by N., W., W. by S. Fresh gales and head sea.

Oct. 1. Lat. 56° 51′ S.; long. 72° 58′ W. Barometer, 29.2; temperature of air, 40°; of water, 42°. Winds: W., W. S. W., W. N. W. Strong gales and heavy sea.

Oct. 2. Lat. 56° 35′ S.; long. 73° 15′ W. Barometer, 29.00; temperature of air, 39°; of water, 42°. Winds: W., W. S. W., S. W. Strong gales, rain, hail, and snow.

Oct. 3. Lat. 56° 34′ S.; long. 72° 42′ W. Barometer, 28.8; temperature of air 39°; of water, 42°. Winds: W. S. W., W., W. S. W. Strong gales, rain, hail, and snow.

Oct. 4. Lat. 56° 39′ S.; long. 72° 48′ W. Barometer, 28.6; temperature of air, 40°; of water, 41°. Winds: S. W., W., S. W. Strong gales and heavy sea.

Oct. 5. Lat. 56° 19′ S.; long. 73° 01′ W. Barometer, 29.0; temperature of air, 41°; of water, 41° Winds: W., W. S. W., W. by S. Fresh gales, sea subsiding.

Oct. 6. Lat. 56° 51′ S.; long. 73° 25′ W. Barometer, 29.7; temperature of air, 43°; of water, 42°. Winds: W., W. by S., W. Fresh gales and heavy sea.

Oct. 7. Lat. 56° 34′ S.; long. 76° 29′ W. Barometer, 29.5; temperature of air, 41°; of water, 42°. Winds: W. by N., W., N. W., W. by W. Fresh gales, long rolling swell.

Oct. 8. Lat. 57° 05′ S.; long. 78° 17′ W. Barometer, 29.6; temperature of air, 42°; of water, 42°. Wind: N. W. throughout. Fresh gales, rain, and hail.

During the above ten days, from close reefs to top-gallant sails; tacking as occasion required, yet not so bad as a winter passage from Liverpool to New York.

Capt. Young, of the ship Venice, of Philadelphia, in his admirably kept abstract, makes also some judicious remarks upon the subject of the Cape Horn passage.

Capt. Young's log is deserving of special notice, also, for the very excellent use he makes of the barometer.

His remark that the indications of the barometer will show when the navigator enters, and when he quits the trades, is perfectly philosophical.

In the calms, both of Cancer and Capricorn, the barometer ought to stand higher—say one-tenth of an inch (0.1) on the average—than it does either in the "variables" on the polar side of these belts, or in the "trades" on the equatorial side of them.

In the belt of the equatorial calms, it also ought to stand, on the average, a little lower than it does in the N. E. or S. E. trades on either side of those calms.

The close attention which Capt. Young gives his barometer, will, as a general rule, enable navigators in most cases to tell whether they have crossed calms or the trade-wind belts, or not.

See also the log of the Great Britain, for Capt. Caldwell's remarks on his barometer during his Cape Horn passage.

Ship Venice (John H. Young), of Philadelphia, New York to California.

Jan. 29, 1850. No observations. Barometer, 29.4; temperature of air, 59°; of water, 68°. Winds: S. S. W., S. W., W. N. W. Discharged pilot at 3 hours 30 min. P. M. At 6 P. M. Neversink Lights bore W. I have determined, during the coming voyage, to keep the abstract log of Lieut. Maury, and thereby add my mite to the cause of science, in the hope that the day is not far distant when navigation shall be so simplified and reduced to "fixed principles," that all uncertainty may be removed. First and middle part, variable and baffling; latter, fine breezes. Strong rippling, which I judge to be the counter current of the stream.

Jan. 30. Lat. 37° 50′ N.; long. 68° 12′ W. Current, one and a half knots, E. by N. Barometer,

29.00; temperature of air, 62°; of water, 73°. Winds: W. N. W., N. N. W., N. N. W. At 4 P. M. the water rose to 70°, and to 73° at 5; water remarkably smooth, with a fine breeze blowing; ship going fast.

Jan. 31. Lat. 36° 55′ N.; long. 63° 32′ W. Current, 19 E., and 5 W. S. W. Barometer, 29.4; temperature of air, 68°; of water, 72°. Wind: N. N. W. throughout. Fine breezes and water smooth; temperature, 73°, during the night fell to 72°. At 9 hours 30 minutes water, 71°. Have paid particular attention to the log since entering the stream, and find that we began to leave the stream about 9 A. M.

Feb. 1. Lat. 35° 21′ N.; long. 60° 27′ W. Current, 15, S. W. Barometer, 29.6; temperature of air, 64°; of water, 71°. Wind: N. throughout. Strong breezes with considerable sea; barometer, rising. I have determined to cross latitude 30° to the west of longitude 50°, if permitted by the wind.

Feb. 2. Lat. 34° 16′ N.; long. 58° 12′ W. Current, 8, S. W. Barometer, 29.8; temperature of air, 66°; of water, 71°. Winds: N., N. N. W., W. N. W. Fresh breezes and pleasant weather.

Feb. 3. Lat. 33° 32′ N.; long. 56° 55′ W. Current, 6 knots, S. W. Barometer, 29.7; temperature of air, 67°; of water, 71°. Winds: W., W. S. W., S. Fine, clear weather; barometer high and steady.

Feb. 4. Lat. 34° 05′ N.; long. 54° 04′ W. Barometer, 29.7; temperature of air, 69°; of water, 72°. Winds: S., S., S. S. E. Fine, clear weather, such as is rarely met with at this season of the year in the North Atlantic. I almost regret the wind hanging here, as I desire much keeping to the west, for the purpose of giving the "Theory" of Lieut. Maury a fair trial, having a "weatherly ship," and no fear of Cape St. Roque.

Feb. 5. Lat. 34° 42′ N.; long. 51° 30′ W. Barometer, 29.6; temperature of air, 68°; of water, 72°. Winds: S. S. E. throughout. Fine, clear weather; the horizon astonishingly clear. I scarcely recollect having more delightful weather—steady glass—smooth water—everything indicating midsummer, more than the last 48 hours.

Feb. 6. Lat. 34° 59′ N.; long. 49° 01′ W. Observed variation, 9° 40′ W. Barometer, 29.6; temperature of air, 68°; of water, 72°. Winds: S. S. E., S., S. First part, fine; middle, barometer, falling fast; dirty appearances; observed variation at sunset, 9.40 W.

Feb. 7. No observations. Barometer, 29.00; temperature of air, 66°; of water, 72°. Winds: S. S. W., W., N. N. E. Cloudy, dirty weather; *not much wind;* barometer steadily falling; ship under short canvas; heavy appearances all round, and every appearance of a heavy gale.

Feb. 8. No observations. Barometer, 28.6; temperature of air, 64°; of water, 72°. Winds: N. N. E., N. E., S. W. Glass still falling; heavy appearances; everything "snug" for a "blow."

Feb. 9. No observations. Barometer, 28.4; temperature of air, 64°; of water, 72°. Winds: S. W., W., W. N. W. During the first and middle part, barometer fell to 28.2, with very bad-looking weather. At sunrise there was but little wind, but in less than half an hour, it blew furiously at S. W., veering to the W.; the sea rose so rapidly I was obliged to "scud;" by 9 A. M., although the wind was blowing very heavy, *the glass began to rise.* Owing to the ship being deep and steering badly, I was induced to try what I had frequently heard of, namely: paying a hawser out astern. I middled and payed out 45 fathoms of 11 inch

hawser on each quarter, and found instant relief; so much so, that I shall most assuredly adopt it hereafter in bad-steering ships.

Feb. 10. No observations. Barometer, 28.6; temperature of air, 68°. Wind: W. N. W. throughout. The gale still continuing, but every appearance of abating. I cannot forbear expressing the great benefit resulting from the trial with "hawser;" feel satisfied I could not have "scudded" without it. I regret being driven to the E.

Feb. 11. Lat. 27° 06′ N.; long. 38° 42′ W. Current, S. E. Barometer, 29.00; temperature of air, 70°; of water, 72°. Winds: W., W. S. W., S. W. First part, moderating, and hauling to westward and southwest. Since observation of 6th, we have had 40 miles of S. E. set. In all my voyages across the equator, I have never been so far east in this parallel before; for although there can be no doubt that the westwardly route is best, yet I have had a great desire to give it a fair trial by keeping *further than usual* to the westward.

Feb. 12. Lat. 25° 34′ N.; long. 36° 31′ W. Current, W. S. W., ½ knot. Variation, 11° W. Barometer, 29.6; temperature of air, 70°; of water, 72°. Winds: S. W., S., S. Throughout, moderate from southern board, with a heavy N. W. swell, for which I allow 15 *miles set;* during the 24 hours, everything apparently combines to capsize my calculations. Variation observed, 11° 5′ W.

Feb. 13. Lat. 25° 18′ N.; long. 35° 42′ W. Current, W. S. W., ¼ of a knot. Barometer, 29.8; temperature of air, 72°; of water, 72°. Winds: S. S. E., S. E., S. E. During these 24 hours tacked several times to avail of a point or two in the wind. My great object is to make southing when possible.

Feb. 14. Lat. 24° 34′ N.; long. 35° 56′ W. No current. Barometer, 29.7; temperature of air, 72°; of water, 72°. Winds: S. S. E., S. S. E., S. Wind still hanging to the southward as I have never known before. Of course, I fully expected the trades ere this, which perhaps increases the annoyance, as I shall almost entirely be deprived of availing of the Pilot Chart, which I approve of so much, that a trial thereof is imperative on me.

Feb. 15. Lat. 23° 30′ N.; long. 35° 12′ W. No current. Barometer, 29.6; temperature of air, 73°; of water, 72°. Wind: variable, from S. to W. throughout. I feel buoyed up, that I am really to have the "trades" soon; since the 12th, a heavy N. W. swell.

Feb. 16. Lat. 21° 40′ N.; long. 34° 00′ W. No current. Variation, 13° 20′ W. Barometer, 29.06; temperature of air, 73°; of water, 72°. Wind: west throughout. Wind breezing up again from westward.

Feb. 17. Lat. 20° 26′ N.; long. 32° 58′ W. Barometer, 29.9; temperature of air, 72°; of water, 72°. Wind: W. S. W. throughout. Wind light and steady from W. S. W., with a tremendous N. W. swell, giving strong assurance that a gale has prevailed in that quarter, which may have interrupted the "trades." I think this the only reasonable way of accounting for their absence; longitude per sun and moon 33° 3′, chronometer, 32° 58′.

Feb. 18. Lat. 20° 00′ N.; long. 31° 44′ W. No current. Barometer, 30.10; temperature of air, 74°; of water, 73°. Winds: S. W., calm, N. N. W. Light airs from southward; middle, calm—heavy clouds

with lightning to the N. W.; the only indication of "trades" is in the rise of the barometer, which I have generally paid some attention to. During 15 voyages across the equator, as master, I have never experienced anything like the present voyage; for, at this season of the year, we have every reason to expect the favorable winds of the "trades" after passing the parallel of 25°. It would be a matter of much satisfaction to know what influence has thus thwarted them.

Feb. 19. Lat. 17° 20′ N.; long. 32° 52′ W. Current, ¼ knot, W. S. W. Barometer, 30.10; temperature of air, 75°; water, 74°. Winds: N., N. E., N. E. First part, light from northward; middle, inclining to eastward; latter, fine breezes and hazy appearances of these winds. The weather is really delightful, and quite a treat, after the annoyances of the last ten days. I hardly yet dare to congratulate myself that the long looked-for trades have come at last, but hope such will prove the case.

Feb. 20. Lat. 14° 32′ N.; long. 32° 20′ W. Current, ½ knot, W. S. W. Observed variation, 11° 15′. Barometer, 30.02; temperature of air, 76°; of water, 75°. Winds: N. E., E. N. E., E. N. E. Fine breezes; everything out, skysails, royal-steering sails, &c., going about 6 knots. The atmosphere extremely hazy; the remains of a new swell still perceptible; observations, sun and moon, 32° 17′; chron. 32° 20′. During these 24 hours, have observed *very great rippling*, resembling in some instances the "tide rips" of "Nantucket Shoals;" tried the temperature frequently without experiencing any change. I had intended to make the remark before, that we have not seen a bird or fish of any kind since crossing the tropic, which must be considered very unusual, particularly with regard to the birds.

Feb. 21. Lat. 12° 16′ N.; long. ——. Current, ¼ knot, W. Barometer, 30.02; temperature of air, 76°; of water, 75°. Winds: E. N. E., E., N. E. Light winds, and every indication of losing the "trades;" the *glass, however, keeps up*. It may not perhaps be amiss to pay some attention throughout this abstract to the barometer with reference to indicating the trade-winds. The rise and fall thereof, I have frequently noticed on entering and leaving the vicinity of trades. During these 24 hours, the ripplings have been very strong, without any apparent change in temperature.

Feb. 22. Lat. 9° 49′ N.; long. 30° 30′ W. Current, one knot, W. N. W. Variation, 10°. Barometer, 30.2; temperature of air, 77°; of water, 76°. Winds: N. E., E. N. E., E. Light winds and hazy atmosphere; very frequent ripplings, more apparent from the extreme smoothness of the water; during the night squalls, unattended with rain; sun and moon, 20° 31′; variation observed, 10°.

Feb. 23. Lat. 7° 13′ N.; long. 29° 45′ W. Current, one and a half knots, N. W. Barometer, 30.1; temperature of air, 78°; of water, 78°. Winds: E. by N., E. N. E.., E. by N. Light breezes and hazy weather; water smooth, rippling very strong, indicating a strong N. W. current. These 24 hours the weather very fine, and, although the barometer has fallen $\frac{1}{10}$, there is no apparent indications of losing our present favorable wind.

Feb. 24. No observations. Current, one and a quarter knots, N. W. Barometer, 29.9; temperature of air, 79°; of water, 79°.5. Winds: E. N. E., N. E., E. S. E. First and middle parts, fine; midnight, barometer, 30.1, at 4 A. M. 29.9; daylight, heavy appearances to S. E.; from daylight to meridian, frequent squalls of wind and rain from S. E. Since 19th, the barometer has remained up until within two hours of

change from N. E. to S. E. I here predict it will remain below 30° until we cross the equator, or get without the influence of the rainy latitude.

Feb. 25. Lat. 3° 10′ N.; long. 28° 40′ W. Current, one knot, N. W. Barometer, 29.9; temperature of air, 83°; of water, 81°. Wind: E. S. E. Heavy squalls during first part; middle, strong breezes and heavy head sea; latter part, squally. During these 24 hours, the barometer has fluctuated *a tenth* several times; weather very warm and sultry; the first "Mother Carey's chicken" of the voyage seen to-day. Thus far, the voyage has been extremely barren of incident, not having seen any vessels for 20 days, and scarcely a bird or fish of any kind.

Feb. 26. No observations. Current, three-quarters of a knot, N. W. Barometer, 29.9; temperature of air, 82°; of water, 82°. Winds: E. S. E., S. E. to S. S. E., S. E. to S. by E. Throughout, heavy squalls rising at south; working round to S. E., with frequent heavy rain; weather very murky and close, at times quite oppressive.

Feb. 27. Lat. 2° 24′ N.; long. 28° 57′ W. Half knot current, W. N. W. Barometer, 29.8; temperature of air, 82°; of water, 82°. Calm throughout, with much rain; a confused sea from S. S. E.

Feb. 28. No observations. Current, half knot W. Barometer, 29.8; temperature of air, 82°; of water, 82°. Wind: E. S. E., calm. Throughout, light airs and calm; heavy looking squalls, but unattended with wind; considerable rain at times.

March 1. Lat. 0° 29′ N.; long. 29° 55′ W. Current, three-quarters of a knot, W. Barometer, 29.8; temperature of air, 84°; of water, 82°. Winds: E. S. E., E. S. E., S. E. First and middle part, heavy squalls of rain; barometer fell to 29.7 at 4 A. M., up again to 29.9; heavy head sea from S. by E.

March 2. Lat. 1° 27′ S.; long. 30° 49′ W. Current, one knot, W. Barometer, 29.7; temperature of air, 82°; of water, 82°. Winds: S. E., S. E., S. S. E. Throughout, fresh and squally from S. E., with rain; of course, ship "close hauled;" heavy head sea from S. by E.

March 3. Lat. 2° 44′ S.; long. 32° 04′ W. Current, one knot, W. Barometer, 29.8; temperature of air, 83°; of water, 82°. Winds: S. E. by S., S. S. E., S. S. E. Throughout, moderate weather, assuming the settled weather of the "trades," *only requiring a rise in the barometer to assure me of that fact*, and I confidently expect the coming 24 hours will so see it.

March 4. Lat. 1° 27′ S.; long. 33° 35′ W. Current, one and a half knots, W. N. W. Barometer, 29.9; temperature of air, 83°; of water, 82°. Winds: S. S. E., S. E., S. E. Throughout, moderate, fine weather; close hauled by the wind. Mer. Barometer, 30.*

March 5. Lat. 6° 8′ S.; long. 34° 37′ W. Current, 1 knot, W. N. W. Barometer, 30.1; tempera-

* "I have no doubt that, although for the last few days the wind has been scant, yet 2° or even 3° more to west would have enabled me to cross, say in 31½° or 32° without any fear, as, from the experience of many voyages to Pernambuco, I never found any difficulty in *getting past* 'Cape St. Roque,' *even in crossing in* 34° on one occasion. In the event of falling to leeward, I would recommend beating along shore *inside the reef* always. There are no dangers but visible ones; at least I found such the case, in beating up from the 'Rio Amazonas,' a few years back."

ture of air, 84°; of water, 82°. Winds: S. E., S. E. by E., S. E. Throughout, moderate, fine weather; every appearance of trades; barometer up; at 8 A. M. made the land.

March 6. Lat. 8° 8′ S.; long. 34° 30′ W. Current, 1 knot, N. W. Variation observed, 2° W. Barometer, 30.2; temperature of air, 84°; of water, 82°. Winds: S. E., E. by S., E. S. E. Throughout, moderate and fine weather; consider myself as fairly within the trades.

MEM.—Having, as I consider, got to the westward far enough to make sure of not being driven back, it may not be out of place to give my humble opinion with regard to the mooted point of making the passage around this bug-aboo, Cape Horn. I most distinctly *disagree* with those who recommend keeping to the eastward of the Falkland Islands; not conceiving the necessity of keeping so far to leeward, rendering the beating against a heavy head sea and strong current necessary. The chances for S. E. winds do *not*, in my opinion, make up for the great difference in distance between eastern and western sides of those islands. My opinion is not predicated solely on the beautiful weather I experienced to the westward of those islands; but to the fact, that to the northward and westward of Staten Land, you are in a measure free from the heavy S. W. swell; which, by reference to *that* part of this *abstract*, it will be observed I had very smooth water, and so continued until I passed Staten Land. In Rio, I had frequent conversations with several whale captains, and their opinions are in conformity with my own. I do not hesitate to say the winter months (May, June, and July), are the best for doubling the cape, with more certainty of easterly winds; the only drawback being the interminable long nights. After all, I feel sure that masters in the European trade, who have, during the California fever, made the passage around the cape, will agree with me in saying, doubling Cape Horn is nothing in comparison with making the passage from Liverpool to New York, during our winter months.

June 2. Lat. 55° 09′ S.; long. 77° 30′ W. Barometer, 30.1; temperature of air, 36°; of water, 41°. Winds: S. W., S. W., S. W. by S. Throughout, heavy from S. W., frequent squalls of snow and rain.

June 3. No observations. Barometer, 29.7; temperature of air, 34°; of water, 42°. Winds: S. W. by W., and W. N. W. First part, strong; middle, more moderate with rain. Ends strong with constant rain; under short canvas, heading to S. W.

June 4. No observations. Barometer, 29.5; temperature of air, 44°; of water, 42°. Winds: W. N. W., W., W. Throughout, heavy gales with constant rain; barometer rose to 30.2, but fell again towards daylight; weather very disagreeable; *filled all our empty casks with most excellent water;* this may be considered rather singular at this season and in this latitude.

June 5. Lat. 52° 13′ S.; long. 79° 15′ W. Barometer, 29.4; temperature of air, 46°; of water, 43°. Wind: W. throughout, strong from the westward.

June 6. Lat. 49° 49′ S.; long. 80° 05′ W. Current, two and three-quarter knots. Variation, 23°10′. Barometer, 29.7; temperature of air, 44°; of water, 44°. Winds: W. by N., S. S. W., S. First part, moderate; middle, squally with rain from southward. Ends same.

June 7. Lat. 46° 28′ S.; long. 80° 47′ W. Current, N. N. E., half knot. Barometer, 29.7; temperature

of air, 45°; of water, 45°. Winds: S. S. W., S. W., S. W. Throughout, heavy with frequent squalls of wind and rain. The weather feels much colder than any we have yet had.

June 8. Lat. 43° 17′ S.; long. 82° 11′ W. Variation, 22° 15′. Barometer, 30.1; temperature of air, 49°; of water, 47°. Winds: S. W., S. S. W., S. Throughout, strong breezes, and frequent heavy rain squalls attended with much rain.

June 9. Lat. 42° 20′ S.; long. ——. Barometer, 30.3; temperature of air, 51°; of water, 48°. Wind: S. and variable. First part, light; middle, variable and calm.

June 10. No observations. Barometer, 30.0; temperature of air, 49°; of water, 49°. Wind: N. W. First part, light; middle, fresh; latter, strong, and dirty appearances.

June 11. No observations. Barometer, 29.8; temperature of air, 52°; of water, 53°. Winds: N. W. W. N. W., W. N. W. Throughout, dirty, drizzling weather; blowing strong at times.

June 12. Lat. 38° 53′ S.; long. 79° 30′ W. Barometer, 29.9; temperature of air, 54°; of water, 54°. Winds: W. N. W., N. W., N. W. Throughout, moderate; constant drizzling rain: very unpleasant.

June 13. No observations. Barometer, 29.4; temperature of air, 54°; of water, 54°. Wind: N. W. by N. throughout. Throughout, moderate; constant drizzling rain; heavy W. N. W. swell.

June 14. Lat. 38° 03′ S.; long. 80° 12′ W. Barometer, 29.4; temperature of air, 60; of water, 54°. Winds: N. W., W. N. W., N. W. Throughout, a most shocking bad 24 hours; calm, heavy gales, torrents of rain, lightning, &c. This is the only *really bad* weather I have yet had, and altogether I have seen *very few* more decidedly unpleasant in my life. It is perhaps rendered more so from not expecting any thing of the kind, presuming bad times had passed, with passing the cape.

June 15. No observations. Barometer, 29.3; temperature of air, 62°; of water, 55°. Winds: N.W., N. W., W. N. W. First part, strong; middle, moderate. Ends heavy gales and torrents of rain. The barometer (during the last four days) has fluctuated repeatedly from 30 to 29; several times in the course of eight hours, presenting the most remarkable fluctuations I ever witnessed. Since 10th, the weather has been very much like the month of March, north 34½° on the coast of United States.

June 16. Lat. 36° 28′ S.; long. 78° 38′ W. Barometer, 29.6; temperature of air, 64°; of water, 55°. Winds: N. W., W. N. W., W. First and middle, very heavy gale. Ends moderating; barometer down several times to 29.

June 17. Lat. 34° 28′ S.; long. 78° 59′ W. Barometer, 30.00; temperature of air, 65°; of water, 56°. Winds: W., W. S. W., S. Throughout, moderate. At 7 A. M. Juan Fernandez in sight, bearing north.

June 18. Lat. 34° 09′ S.; long. 80° 01′ W. Barometer, 29.8; temperature of air, 65°; of water, 56°. Winds: calm, N. N. W., N. W. First part, calm; middle, strong; latter, blowing hard, much rain. Barometer fluctuating $\frac{5}{10}$ several times during the 24 hours. At 8 A. M. Massafuera in sight, west per compass.

June 19. No observations. Barometer, 29.6; temperature of air, 65; of water, 57°. Wind: N. W. throughout. Throughout, heavy weather, with almost constant rain. The fluctuations in barometer still continuing, causing a deal of uneasiness; I have never had anything like it before; and this, after being an attentive observer of that instrument for more than twenty-two years.

June 20. Lat. 32° 10′ S.; long. 78° 38′ W. Barometer, 29.6; temperature of air, 66°; of water, 58°. Winds: N. W., N. N. W., W. Throughout variable, but most remarkable; from calm to lying to, torrents of rain, clear, lightning, heavy sea, smooth as a mill-pond; and thus, during the 24 hours, every variety of weather under the sun, with the same fluctuations in the barometer. I am disposed to think *all this* is occasioned by, or a prelude to, some great change, perhaps an earthquake; who knows?

June 21. Lat. 29° 58′ S.; long. 79° 41′ W. Barometer, 29.9; temperature of air, 63°; of water, 59°. Winds: S. W., S., S. S. W. Throughout squally with rain; wind during squalls hauling far as W. N. W.

June 22. Lat. 28° 46′ S.; long. 79° 53′ W. Barometer, 30.00; temperature of air, 65°; of water, 59°. Winds: S. S. W., calm, N. W. First part, squally; middle, calm; latter part, moderate. By looking back, it will be seen I have been unable to get to the west, being desirous of crossing the equator about 115°, at the suggestions of many experienced "whalemen." My own judgment would have suggested 90°, but the above advisers recommend their crossing far west, on account of better winds.

June 23. Lat. 26° 50′ S.; long. 78° 45′ W. Variation observed, 13° 50′. Barometer, 29.9; temperature of air, 66°; of water, 62°. Wind: N. W. throughout. Throughout, light winds and smooth water; wind at times favoring, so as to lay north, but mostly N. N. E., which, with the variation, makes easting fast.

June 24. Lat. 25° 29′ S.; long. 79° 40′ W. Current, N. N. E., half knot. Barometer, 30.00; temperature of air, 66°; of water, 64°. Winds: W., W. S. W., S. W. Throughout, light winds and drizzling rain most of the time; but wind being so much better of late, the change is quite acceptable.

In consideration of this very strong evidence in favor of the western or new route to the line, I quote an extract from the log-book of the brig Eolian, C. A. L. Blanchard, master.

The Eolian sailed from New York, May, 3, 1851, with the Charts on board. She crossed the equator in 31° W., June the 9th—passed St. Roque, June, 12 (40 days out), without going to the west of longitude 33°.

The captain, in compliance with my general request, that every navigator would state in his abstract whether he had a longer or shorter passage than vessels arriving about the same time without the Charts, says:—

"You will see by this abstract, my passage has been somewhat lengthy, but, in comparison with many vessels which have arrived without your Sailing Directions, it has been short. One barque from Boston having a passage of seventy-five days, and two Baltimore vessels (fast sailers) had a passage of sixty-eight and seventy days; also one from the same port of eighty-five days. The above vessels crossed the line far to the eastward."

I have also the abstract of the N. B. Palmer (Charles P. Low, master), that sailed from New York, April 7 (4 days after the Eolian), also with the Charts on board. She too took the new route—she passed

the Eolian, May 10 (the third day out). Both vessels that day crossed the parallel of 37° N.; the Eolian in longitude 56°, but the N. B. Palmer 8° farther west. This ship crossed the line in 31° W., June 2, and the parallel of Rio, June, 15, or two weeks ahead of the Eolian; and from 59 to 46 days ahead of the vessels mentioned by Captain Blanchard, which had not the Wind and Current Charts, and which went the old route.

So, also, with Captain Caldwell, of the Great Britain. I quote his letter, and extract from his very valuable abstract log, because of the information which they give as to the Cape Horn passage.

"*June* 14, 1852 (SAN FRANCISCO). I herewith forward you the abstract log of ship Great Britain, of Boston, under my command from New York to this port. The ship is 25 years old, and *not a clipper.* The ship John Jay sailed in company, not yet arrived. The last I heard from her she was at Rio, leaky. I do not know whether she had your Charts. The clipper ship Aramingo left New York three days after we did, say 12th January, *without* your Charts, went nearly to the Western Islands, crossed the line in about 26° W., went east of Falkland Islands, I believe, and arrived here one day after I did, say 138 days, without stopping. On my Chart (Blunt's), I find St. Paul's Island placed in long. 28° 20′ W., and in some editions of Bowditch the same; while in other editions, and in Horsburg's *Directory*, 29° 15′ to 29° 22′ W. As this island is directly in the track of outward bound ships, it is important that *all charts and books* should be correct. I passed close to it, having had a good observation in the *morning.* It was cloudy when I passed it, about 4 or 5 P. M., but there is no doubt that it is in about 29° 20′* and *not* 28° 20′. With regard to your Charts, allow me to say I think very highly of them. I crossed the equator in about 30° in 26½ days from New York, after losing my tiller and being thereby detained 16 hours with a *strong fair gale.* I passed to the windward of Noronha, cleared St. Roque and St. Augustine, and the first time I tacked ship from New York was south of Rio, which I passed in less than 37 days, with a very deep ship. Passed through the Straits of Le Maire in 60 and Cape Horn in less than 61 days. After that, I had miserable chances. Having been nearly 20 years a shipmaster, and having, during my passage, given the subject much consideration, I will venture, at the risk of being thought presuming, to state my own views on the passage from Cape Horn to this port. Being up with Cape Horn, I would improve all opportunities of making *westing*, with very little regard to latitude, except to keep clear of the land, till in long. of 80° W., then, if wind permitted, edge off very gradually to the N. and shape my course so as to be in the long. of 110° W., in about 30 S. lat.; here you may expect to get the S. E. trades; and then make a due north course *till I took the N. E. trades.* My *reasons* are that you would thus make your westing where the degrees are short, and then cross the entire S. E. trades on a course that would let all your canvas draw, instead of running so much before the wind as to becalm your head sails. You would thus take the N. E. trades in about 110° W., which is as far east as desirable. You will see by the log that the doldrums did not detain me much on either side."

* Its position was accurately determined by the officers of the U. S. ship Marion, in 1849, to be in long. 29° 18′ W., and it is accurately laid down on the *Wind and Current Charts.*—M. F. M.

From Captain Sears, of the Wild Ranger, San Francisco, October 25, 1853.

I followed your track to the equator for July, and had a passage of 28 days to the equator; crossed in 32° 20′; just cleared Rocas, and then had a very hard chance to Cape Horn. I highly approve of your track from Boston to the equator, and have no doubt but that I gained by following your instructions. I found very little current near St. Roque. I intended to have gone through Straits of Le Maire, but the wind being S. W., I could not get far enough to westward, and thought it better to pass eastward of Staten Land. With regard to a passage around Cape Horn, I would say I have seen worse weather between Boston and Liverpool in September, than I have seen for this passage north of the equator. I had a long spell of calm weather, which prolonged my passage. But find, on arrival, that I was in company with four other clipper ships, and all arrived here same day.

Ship Huguenot (J. G. Stover), San Francisco.

May 24, 1853. The ship George Evans arrived here three days after we did, in, I believe, 151 days from Philadelphia; he crossed the equator on this side in 105°; has not your Charts on board.

The ship Astrea, which sailed from New York two days before us, has not yet arrived.

Cape Horn navigators should not forget that the prevailing winds encountered in doubling the cape are westerly winds; that the Andes, which, in fact, terminate only with the continent, stand up as a barrier to these winds; and consequently, these winds come around the cape in violent sweeps, puffs, and gales, as they do around the bluff point of land in a harbor, or the corner of a building on shore; and that the strength of these sweeping winds is probably felt with more force near the cape than it is at a considerable distance off, and out of the influence of the land upon the course and velocity of the wind.

Therefore I would advise navigators, in doubling the cape, first to pass through the Straits of Le Maire, if practicable, and, if they can, accomplish it by daylight, for the currents are unfrequently strong and conflicting there; to hug the cape as closely as the winds on one hand and the rocks on the other will allow, and so make westing down there when the degrees are short, as fast as, without fighting adverse winds and weather, they may do, until they cross, if bound to California, the parallel of 50° S., between the meridians of 80° and 90° west.

But if, after getting through the straits, and before doubling the cape, a westerly gale strike them in the teeth, then, instead of stopping there off the pitch of the cape to fight against it, with the intention of holding their own until the gale abates, or the wind slants so as to let them get round, I think the chances would be altogether in their favor, by sticking her away south, under the expectation that they would soon get out of the strength of the winds, which, eddy-like, come sweeping around Cape Horn, sometimes at one distance, sometimes at another, according to the direction of the gale. But even in doing this, the navigator who is desirous of making a quick passage, will not fail to take advantage of slants. He will always prefer, until he doubles the cape, the tack upon which he can make the most westing. Vessels intending to touch at Valparaiso, or any of the Intermedios, need not care to get so far west while they are south

of the parallel of 50°, even when the winds are fair, as vessels that are bound farther north, as to California, for example. Let these last make westing whenever they can, without making southing also. They cannot well cross the parallel of 50° S. too far west, on their way to California, provided they keep to the east of 100° or 110°.

The Pilot Charts of the South Atlantic and Cape Horn, in addition to the Track Charts, leave but little more to be said with regard to the passages west, around Cape Horn, than may be gathered from the injunction: Study the Pilot Charts.

I think that I may now congratulate navigators, especially those who are co-operating with me, and whose labors have enabled me to bring about these results, upon the present complete state of our knowledge with regard to the route to Rio.

From St. Roque to Rio is plain sailing, and as far as St. Roque, from the United States, the route is the same whatever be the destination of the vessel, whether Cape of Good Hope, Cape Horn, or Rio.

The route to the clearing of St. Roque, I think I may be permitted to say, without incurring the imputation of self-praise, is as well understood as it is possible for any route across the ocean to be, that is governed and controlled by the force of winds and currents.

From the parallel of St. Roque, the route around Cape Horn, for all vessels from Europe or the United States, is the same.

And from the parallel of St. Roque to the parallel of 50° S., all is also plain sailing, requiring, however, the most watchful vigilance as the price of a quick passage between these parallels, for much of the distance lies through a region of baffling winds.

The average of vessels under canvas from the parallel of St. Roque to 50° S. on the Cape Horn passage, is only about 100 miles a day. The intelligent seaman needs no other sailing directions here than simply: "Make the best of your way south." Of course, he will understand that this "best way" is not to be supposed to lay so close along with the land as to bring him within the influences of the land breezes and the calms of the coast.

Besides this injunction, there is but another simple caution to add, and that is, when you arrive at the calms of Capricorn, do your best to get south; for, by that course, it is easiest to clear them. As to the parallels between which, at the different seasons of the year, you may expect the calms, see the Trade-Wind Chart.

From 50° south, east of Cape Horn, to the same parallel west, lies the rub—so it is supposed. Along this part of the route the prevailing winds, it is true, have westing in them, and are, therefore, in a great measure, head winds. How to overcome them depends on the skill of the navigator. The grand object of this work is to let the navigator know how he may expect to find the winds, which way the currents; taking it for granted that, when he knows this, his own skill and intelligence will best guide him as to the rest.

The Pilot Charts will give this information as to winds, in a general way. With the view of presenting it in a more special way, extracts have been made from various abstract logs, taken at random, showing

the wind and weather encountered by each vessel. These are arranged according to the months, and may be regarded as practical illustrations of the Pilot Charts.

With such sources of information before him, the Cape Horn navigator, who studies them closely, can never, in changes of wind, feel at a loss either as to the best course to steer, or the best tack to put his ship upon, for the best passage.

I have often, in the progress of these labors, had occasion to feel myself indebted to merchants and other citizens of the United States, besides those who follow the sea, for that wholesome assistance which the influences of sympathy, good wishes, and suggestions of good and useful men never fail to spread abroad and around. Among the earliest of these was R. B. Forbes, of Boston. He took a lively and active interest in the undertaking from the first, and before it had given any practical results in demonstration of its usefulness.

I well recollect the surprise he expressed, and how over sanguine he appeared to consider me, when I suggested to him as among the achievements of the future, the probability of his seeing the run made to the equator, on the new route to Rio, within 18 days. It has been done in 17, and several times within 18. Among the valuable suggestions, however, made by him, was one in relation to the harbors about Cape Horn. He thought that vessels when caught or threatened by a gale in the act of doubling Cape Horn, would frequently find both profit and advantage by seeking shelter for the while in some of the many fine harbors or anchorages which the excellent surveys of King and Fitz Roy show to be there. In proof that this was a good and practicable idea, I am at last enabled to adduce the result of actual trial.

Nassau Bay offers a resource to Cape Horn navigators which they should not overlook, and of which they may not unfrequently take advantage in stormy weather. With easterly winds it affords a short cut to vessels passing through the Straits of Le Maire on the way to the Pacific, and in case of westerly gales it affords a lee. My attention was called to it by Mr. George B. Upton, of Boston, in consequence of the use made of it by his ship, the Plymouth Rock. Captain Fitz Roy has given me a very good survey of it, and his Charts, it is presumed, are to be found on board of every vessel bound around Cape Horn. As to the occasions and circumstances when navigators should avail themselves of the advantages offered by this bay, I am not able to give any directions, nor to make any suggestions, further than to say: When ships are passing that way, each master must decide for himself, because, knowing the circumstances of his own case, he can consult his own judgment to more advantage under the circumstances, than he can any sailing directions that I can give.

Mr. Upton's letter contains useful information and is suggestive, and, therefore, I hope he will not take offence on account of its publication here:—

BOSTON, *Dec.* 22, 1854.

MY DEAR SIR: Whenever I have sent a full built ship to the Pacific, I have generally had to provide for the contingency of their putting into Valparaiso for water. I have sometimes suggested Juan Fernandez, and in one instance (ship Reindeer), have had a ship water there.

My ship, Plymouth Rock, on her voyage from New York to Panama, passed through Nassau Bay instead of going outside, and as I have never seen the track of any American ship, I venture to send you hers, through there, taken from one of Captain Fitz Roy's Charts.

The ship left New York June 10, and arrived at Panama October 8. Captain Patterson will, no doubt, give you his whole abstract log of the voyage, on his return to the United States. The great object of my writing you at this time is to draw your attention to this important inlet (Nassau Bay) as a good place for vessels to go in for any temporary repairs, and also to obtain wood and water.

A young gentleman who went out in my ship, and from whom I derive this information, says they stood up (Sept. 2) with an intention of going outside, but took a strong, heavy southwest gale and sea, stood back, and put into the bay; found the weather there moderate; thermometer 50°; wind, light from N. W.; the navigation in and through the bay, perfect. He landed on one of the small islands next to Wallaston Islands, near Cape Hale; good landing; fresh water, perfectly accessible and very good; apparently good anchorage all around the shores. Saw wood growing which could be obtained with little trouble.

I am aware that I am not giving you any new information *in the abstract*, but our shipmasters rather avoid a new route without some of their own countrymen comrades have previously been over the ground.

Whenever you get abstracts of the logs of ships off Cape Horn early in September, and bound west, I think you will find that they had heavy westerly winds, snow squalls, and heavy swells.

I am, with great regard,

Your obedient servant,

GEO. B. UPTON.

CAPE HORN TRACKS.

Danube (C. H. Chase).

Jan. 4, 1853. Lat. 30° 36′ S.; long. 40° 36′ W. Barometer, 30.00; temperature of air, 73°; of water, 73°. Winds: N. W. to S. E., S. E. to N. E., S. First part, squally, with sudden changes in the breeze, say from very light airs to strong squalls; middle part, changes not so sudden, but variable and light; latter part, fine breeze from S., and beautiful weather. Four ships in company. Saw a black-colored bird resembling a cape goose.

We have now been at sea fifty-two days, forty-eight of which the wind has had more or less southing in it. I think the Danube has done well to be thus far on her passage. Thanks to Lieut. Maury, and those *hard workers* with him, who have given us such *invaluable* information.

Jan. 5. Lat. 31° 30′ S.; long. 42° 13′ W. Barometer, 30.15; temperature of air, 72°; of water 71°. Winds: S., S. S. E., S. E. First part, fine breeze; middle part, very moderate and clear; latter part, hazy

and light breezes, with long rolling swell from S. W. Two ships in company. This has been the most pleasant twenty-four hours since leaving New York. Long strings of jellies, such as are sometimes seen off the Western Islands. Cape hens and skipjacks around the ship.

Jan. 6. Lat. 33° 06′ S.; long. 44° 00′ W. Barometer, 30.00; temperature of air, 72°; of water 70°. Winds: S. E., N. E., N. E. Pleasant breeze and fine weather these twenty-four hours; at times, a long swell from S. W. At 12 M. dark-looking weather towards the W.

Jan 7. Lat. 34° 36′ S.; long. 46° 00′ W. Barometer, 29.60; temperature of air, 72°; of water, 69°. Winds: N. E., N. W., S. W. First part, fresh breeze and light squalls, all sail set; middle part, strong squalls, single-reefed topsails; latter part, heavy squalls, close reefs; lost the foresail, and split main topmast staysail.

Jan. 8. Lat. 36° 22′ S.; long. 45° 30′ W. Barometer, 29.80; temperature of air, 62°; of water, 68°. Winds: S. W., W. S. W., W. S. W. Strong gale and violent squalls until 10 A. M. Close reefs.

Jan. 9. Lat. 37° 04′ S.; long. 45° 17′ W. Barometer, 29.80; temperature of air, 61°; of water, 63°. Winds: W. S. W., W., W.; hard gales, rough sea, and bad weather.

Jan 10. Lat. 36° 51′ S.; long. 45° 00′ W. Barometer, 30.00; temperature of air, 62°; of water, 62°. Winds: W. S. W., S. W., S. W.; first part, strong gales, and very rough, cross sea, close reefs; middle part, more moderate, double reefs; latter part, squally, single reefs. Tacked to W. N. W.

Jan. 11. Lat. 36° 25′ S.; long. 46° 42′ W. Barometer, 30.15; temperature of air, 64°; of water, 66°. Winds: S. W., S. W., calm; first part, moderate and light squalls; royals set; middle part, long, smooth swell, and moderate; latter part, light airs from S. W., and calms.

Jan. 12. Lat. 37° 50′ S.; long. 49° 23′ W. Barometer, 30.00; temperature of air, 68°; of water, 66°. Winds: W., W. N. W., W. by N.; clear weather and royal breeze for the 24 hours; the greenish color of the water of yesterday is not to be seen to-day; no albatrosses, nor sea-hens. Heavy S. W. swell leaving us; sea much more smooth at 12 M. than at 8 P. M. I think, if we could have got farther to the westward ere this, we should have been much farther on our voyage.

Jan. 13. Lat. 38° 09′ S.; long. 50° 33′ W. Barometer, 30.10; temperature of air, 68°; of water, 65°. Winds: S. W. to N. W.; calm, E. S. E. Throughout the 24 hours very light airs, and variable; smooth sea, and thousands of little sea-gulls on the water; hazy, damp weather, with flying fog from N. E.

Jan. 14. Lat. 39° 49′ S.; long. 53° 46′ W. Current, ¾ knot per hour, N. E. by E. Barometer, 29.90; temperature of air, 65°; of water, 60°. Winds: E. S. E. to S. E., S. E., S. E. by S. First part, moderate; middle and latter parts, fresh breeze and flying fog. Great quantities of birds, as albatrosses, &c.

Jan. 15. Lat. 40° 37′ S.; long. 56° 11′ W. Current, 1 knot per hour, N. E. Barometer, 29.95; temperature of air, 55°; of water, 50°. Winds: S. E. by S., S. S. E., S. First part, very foggy with fresh breeze; much kelp; middle part, more clear; water much discolored; latter part, clear weather, and water of greenish appearance, and strong rips like tide rips; large patches of kelp; sea at one time very smooth, and at another very rough. Sounded; no bottom with 110 fathoms; good sound.

Jan. 16. Lat. 40° 37′ S.; long. 56° 05′ W. Current, 1¼ knot per hour, N. E. Barometer, 29.95;

temperature of air, 52°; of water, 48°. Wind: S., calm, calm. First part, very moderate. At 4 P. M. sounded in 60 fathoms; fine, dark sand; light air from W. S. W.; middle and latter parts, calm; much kelp; strong rips. At 8 A. M. sounded; *no bottom*, 115 fathoms.

Jan. 17. Lat. 42° 31′ S.; long. 57° 42′ W. Current, 1½ knots per hour, N. E. by N. Barometer, 29.60; temperature of air, 55°; of water, 48°. Winds: W. N. W., N. W., S., and variable. First part, gentle breeze; middle part, light breeze, and fine, clear weather; latter part, light rain squalls from S. W., and very moderate; very small, tired-looking land birds on board; also, flocks of small millers or moths; water much discolored; much kelp and floating weeds; sounded; no bottom, 115 fathoms.

Jan. 18. Lat. 42° 16′ S.; long. 58° 02′ W. Current, 1¾ knots per hour, N. E. by N. Barometer, 29.90; temperature of air, 51°; of water, 48°. Winds: S. by W., S. S. W., calm. Moderate for 24 hours; fogs and clear weather about every two hours. Kelp and feathers in large quantities.

Jan. 19. Lat. 43° 29′ S.; long. 58° 11′ W. Current, 1¾ knots per hour, N. E. by N. Barometer, 29.50; temperature of air, 51°; of water, 51°. Winds: calm, N., S. W. Middle part, squalls, rain, and calms, very changeable; latter part, thunder, lightning, hard squalls. Much kelp; water quite blue; wind from W. to S. W.

Jan. 20. Lat. 44° 36′ S.; long. 58° 36′ W. Current, 1½ knots per hour, N. E. by N. Barometer, 29.70; temperature of air, 54°; of water, 51°. Winds: S. S. W., N. W., S. Weather changeable, sometimes a gale, and sometimes almost calm. Wind sudden in its changes, clear at times and then hard squalls. Kelp and numerous birds.

Jan. 21. Lat. 45° 05′ S.; long. 60° 21′ W. Current, 1 knot per hour, N. E. by N. Barometer, 29.70; temperature of air, 52°; of water, 47°. Winds: calm, S., N. W. First and middle parts, calms and light airs; latter part, fine breeze and clear weather; long rolling swells from south. Kelps, strong rips like tide rips; at one time very smooth, at another very rough. Dark, heavy fog bank at south.

Jan. 22. Lat. 47° 25′ S.; long. 60° 44′ W. Current, 1 knot per hour, N. E. by N. Barometer, 29.70; temperature of air, 52°; of water, 49°. Winds: W. N. W., W. S. W., S. S. W. Fine clear weather for 24 hours, with steady breeze. All sail set. Barometer no use; varied in the 24 hours from 29.50 to 29.90. At 4 P. M., sounded in 60 fathoms, fine dark sand. Kelp, penguins, and numerous other birds. To-day, noon, water quite blue, having passed this morning strong tide rips. Sea smooth and rough at times.

Jan. 23. Lat. 47° 58′ S.; long. 60° 36′ W. Current, ½ knot per hour, N. N. E. Barometer, 29.90; temperature of air, 50°; of water, 49°. Winds: S. W., S. W. by S., S. W. by S. Unsteady winds, hard flams, and smoky looking weather. Kelps and sea-weed. Tacked to the westward. Heavy rolling sea from S. W. Split maintop-gallant sail.

Jan. 24. Lat. 48° 01′ S.; long. 60° 45′ W. Barometer, 30.00; temperature of air, 50°; of water, 49°. Calm throughout the day. A heavy rolling sea from S. W.

Jan. 25. Lat. 49° 57′ S.; long. 62° 30′ W. Barometer, 29.70; temperature of air, 50°; of water, 50°. Winds: N. N. W., N. W., N. W. First part, calms and light airs; middle part, moderate breezes; latter part, thick and rainy, fresh breeze. Water much discolored.

Jan. 26. Lat. 50° 06′ S.; long. 63° 06′ W. Barometer, 29.60; temperature of air, 50°; of water, 50.° Winds: W. N. W., S. W., S. S. W. First part, fine breezes; all sail set. At 8 P. M., wind hauled in a squall to S. S. W., strong gale; double reefs. Latter part, heavy sea and hard gale from S. W. to S. S. W.; close reefs. Water much discolored. No doubt soundings extend from about lat. 40° 40′ S., and long. 57° W., on a S. S. W. line per chart, to Tierra del Fuego.

Jan. 27. Lat. 50° 27′ S.; long. 63° 02′ W. Barometer, 29.60; temperature of air, 50°; of water, 49°. Winds: S. S. W., S. W. by W., S. S. W. Gales, squalls, and variable winds, always from the southward. Wore ship about six times during the 24 hours.

Jan. 28. Lat. 50° 7′ S.; long. 63° 35′ W. Barometer, 29.70; temperature of air, 49°; of water, 46°. Winds: S. W., W., S. S. W. Through this 24 hours, strong gales, and very heavy sea. At 4 A. M., wind hauled in a squall from S. W. by W. to S. S. E.; wore ship. At 5 A. M., wind in the usual quarter, S. S. W.; brig in company, and has been for the last three days.

Jan. 29. Lat. 50° 39′ S.; long. 63° 57′ W. Barometer, 29.80; temperature of air, 50°; of water, 48°. Winds: S. S. W., W. S. W., S. W. Fresh gales, and squally; from top-gallant sails to close reefs; latter part, hard hail squalls; large quantities of kelp; water much discolored; very rough sea at times, and then smooth; four sail in sight.

Jan. 30. Lat. 51° 23′ S.; long. 64° 11′ W. Barometer, 29.70; temperature of air, 50°; of water, 48°. Winds: S. W., S., N. N. E. First part, fresh breezes, squalls; middle part, light airs and calms; latter part, gentle breeze from N. N. E., and thick weather; heavy rolling sea from south, and water much discolored; kelps; white stormy petrels, the first I have ever seen; if not white petrels, they have the same *motions*, are of the same form and size, and follow in the wake, same as all others; two sail in company.

Jan. 31. Lat. 53° 26′ S.; long. 63° 32′ W. Barometer, 29.50; temperature of air, 50°; of water, 48°. Winds: N. E., S. W., E. S. E. First and middle parts, strong breezes, hard hail squalls, and steady rain; latter part, squalls and rain from E. S. E. to S.; water quite blue; much kelp and many birds.

Feb. 1. Lat. 54° 29′ S.; long. 63° 39′ W. Barometer, 29.70; temperature of air, 46°; of water, 45°. Winds: E. S. E., calm, calm. First part, moderate; middle and latter parts, calm; saw the land, Cape St. John, S. S. E. per compass; am satisfied that soundings extend *much* farther eastward from the River La Plata towards the Falkland Islands, than laid down on any chart I have seen; to-day much kelp, and strong tide rips.

Feb. 2. Lat. 54° 04′ S.; long. 63° 38′ W. Barometer, 29.60; temperature of air, 46°; of water, 45°. Winds: calm, calm, S. E. Latter part, light airs from S. E. Throughout the 24 hours, long, rolling swell from S. E.; Cape St. John, S. S. E. by compass, distant about 30 miles.

Feb. 3. Lat. ——; long. ——. Barometer, 29.50; temperature of air, 44°; of water, 44°. Winds: S. E., N. E., N. E. First part, very light, strong N. N. W. current; middle and latter parts, fresh from N. E., and fine weather; have had several opportunities to test the correctness of chronometer; find it perfect. At noon, west end of Staten Land, N. W. by W. ½ W. by compass; east end, N. by E.

Feb. 4. Lat. 56° 18′ S.; long. ——. Current, 2 knots per hour, N. E. Barometer, 29.50; tempera-

ture of air, 45°; of water, 46°. Winds: N. E., N. E., S. S. E. First and middle parts, fresh gale and thick rainy weather; latter part, very pleasant. At noon, Cape Horn, W. N. W. ½ W. by compass.

Feb. 5. Lat. 56° 37′ S.; long. 69° 38′ W. Current, 0.7 of a knot per hour, N. E. by E. Barometer, 29.40; temperature of air, 46°; of water, 41°. Wind: N. E. throughout. Steady gentle breeze for 24 hours, from 3 to 6 knots per hour. At — A. M., Diego Ramirez, N. W. by compass, distant 3 miles; long. —; rolling swell both from east to west.

Feb. 6. Lat. 56° 29′ S.; long. 71° 30′ W. Barometer, 29.65; temperature of air, 48°; of water, 46°. Winds: S., S. W., calm. First and middle parts, very light airs, and pleasant; latter part, calm, and light rain squalls from N. W.; no kelp; whales and penguins in plenty.

Feb. 7. Lat. 56° 31′ S.; long. 72° 28′ W. Barometer, 29.65; temperature of air, 46°; of water, 46°. Winds: W. S. W., W. N. W., W. S. W. First and middle parts, very light breeze; latter part, hard hail squalls with strong breeze.

Feb. 8. Lat. 56° 30′ S.; long. 74° 00′ W. Barometer, 29.70; temperature of air, 46°; of water, 44°. Winds: W. S. W., variable, N. W. by W. First part, squally; middle part, calms and light variable winds; latter part, good breeze from N. W. by W., and squally.

Feb. 9. Lat. 56° 49′ S.; long. 77° 03′ W. Barometer, 29.40; temperature of air, 44°; of water, 44°. Winds: N. W. by W., W. N. W., W. Rain, hail, and squalls; sea in heaps, very thick for 24 hours.

Feb. 10. Lat. 55° 11′ S.; long. 77° 17′ W. Barometer, 29.60; temperature of air, 44°; of water, 44°. Winds: W., W. S. W., W. N. W. Fresh breeze for 24 hours; bad sea, and rough weather.

Feb. 11. Lat. 55° 50′ S.; long. 79° 55′ W. Barometer, 29.25; temperature of air, 45°; of water, 44°. Wind: N. W. by W. throughout. Strong gales, hard squalls, and rough sea, for the 24 hours, with just rain enough to keep one uncomfortable.

Feb. 12. Lat. 55° 46′ S.; long. 80° 20′ W. Barometer, 29.20; temperature of air, 43°; of water, 44°. Winds: W. N. W. and W. S. W., W., N. W. by W. Same as yesterday, only that the hailstones are larger, and squalls more violent. Lat. (D. R.) 55° 36′; long. (D. R.) 80° 49′.

Feb. 13. Lat. 56° 13′ S.; long. 80° 35′ W. Barometer, 29.20; temperature of air, 44°; of water, 44°. Winds: N. W. by W., W. N. W., W. N. W. Strong gales, hard squalls, heavy sea and close reefs. Lat. (D. R.) 56°; long. (D. R.) 81° 05′.

Feb. 14. Lat. 56° 37′ S.; long. 80° 52′ W. (D. R.). Barometer, 29.20; temperature of air, 44°; of water, 44°. Wind: W. N. W. throughout. Hard gales, hard squalls, and a hard time; close reefs and very bad sea.

Feb. 15. Lat. 55° 25′ S.; long. 80° 02′ W. Barometer, 29.20; temperature of air, 46°; of water, 44°. Winds: W. N. W., W. N. W., S. W. Strong gales and hard squalls up to 4 A. M. At meridian all reefs out; squally. Lat. (D. R.) 55° 23′; long (D. R.) 80° 30′ W.

Feb. 16. Lat. 53° 54′ S. (D. R.); long. 80° 15′ W. (D. R.). Barometer, 29.10; temperature of air, 43°; of water, 44°. Winds: W. N. W., calm, S. E. by E. First part, squally and variable; middle part, calm; latter part, thick and rainy. Very heavy swell from the west; many small gulls around the ship.

Feb. 17. Lat. 52° 38′ S.; long. 80° 15′ W. Barometer, 29.20; temperature of air, 44°; of water, 44°; Winds: S. S. E., S. W., W. by S. First part, fine breeze; middle part, almost calm; and latter part squally. Lat. (D. R.) 52° 03′; long. (D. R.) 80° 50′. If our indefatigable Lieut. Maury can find a passage of same length of time, with as *much* head wind in it as this, I shall believe I am not alone. Shall give you the true *log* distance when we strike the S. E. trades.

Feb. 18. Lat. 50° 15′ S.; long. 80° 20′ W. Barometer, 29.50; temperature of air, 44°; of water, 46°. Winds: W. by S., W. S. W., W. S. W. Through the 24 hours, hard squalls and very large hailstones. Lat. (D. R.) 49° 56′; long. (D. R.) 80° 37′.

N. B.—In all cases the longitude and latitude (D. R.) are brought forward last observations; log regularly hove every two hours during the passage.

Feb. 19. Lat. 47° 45′ S.; long. 80° 46′ W. Barometer, 30.00; temperature of air, 47°; of water, 47°. Wind: W. S. W. throughout. First part, hard squalls, and the largest hailstones I ever saw; middle part, more moderate; latter part, light squalls. All canvas set. Large flocks of birds. Lat. (D. R.) 47° 34′; long. (D. R.) 80° 37′.

Contest, fifty-three days out.

Jan. 8, 1853. Lat. 50° 46′ S.; long. 60° 55′ W. Winds: S. W. by S., S. W. First part, brisk breeze. and cloudy; middle part, moderate; latter, fresh. Single reefs.

Jan. 9. Lat. 50° 32′ S.; long. 63° W. Winds: S. S. W., S. S. W., N. W.; comes in fresh and squally. A strong current setting to the S. E. Middle and latter parts, light.

Jan. 10. Lat. 53° 30′ S.; long. 64° 41′ W. Winds: N. W., S. W., S. W. by W. First part, light airs, and pleasant; middle, light breezes; latter, moderate and fine. Have had a large swell heaving from E. N. E. since 6 this morning.

Jan. 11. Lat. 56° 14′ S.; long. 66° 34′ W. Winds: W. N. W., W., S. First part, pleasant breezes. At 7 P. M. saw Cape St. Diego, bearing S. by W., distant ten miles. At 9 P. M. passed through the straits, Cape Bartholomew bearing per compass east, distant ten miles. Latter part, strong gales from south. At meridian, Cape Horn bore W. ½ N., twelve miles distant.

Jan. 12. Lat. 57° 4′ S.; long. 65° 38′ W. Winds: S. W., S. W. by S., S. W. All these twenty-four hours, strong gales, with hail and sleet in squalls.

Jan. 13. Lat. 58° 46′ S.; long. 66° 2′ W. Winds: S. W., calm, W. first part, fresh breezes; middle, calm; latter, light and rainy.

Jan. 14. Lat. 58° 33′ S.; long. 68° 44′ W. Winds: W. S. W., W. S. W., W. First and latter parts, fresh breezes; middle part, moderate.

Jan. 15. Lat. 59° 26′ S.; long. 70° 25′ W. Winds: W., W. S. W., calm. First part, fresh winds; middle, light, and thick weather; latter, calm and thick.

Jan. 16. Lat. 57° 31′ S.; long. 74° 2′ W. Winds: calm, S. E., S. W.; begins calm; ends fresh, with a rugged cross sea.

Jan. 17. Lat. 56° 8′ S.; long. 76° 22′ W. Winds: W. S. W., W. First part, fresh and cloudy; middle, moderate; latter part, strong, with thick rainy weather.

Jan. 18. Lat. 54° 27′ S.; long. 79° 52′ W. Winds: W., S. W., S. W. First part, fresh, and cloudy weather; middle, rainy; latter, strong and squally.

Jan. 19. Lat. 50° 23′ S.; long. 81° 9′ W. Winds: S. W., W. S. W., W. S. W.; brisk breezes all these twenty-four hours, with cloudy, misty weather.

F. W. Brune (D. C. Landis).

Jan. 10, 1853. Lat. 49° 19′ S.; long. 64° 5′ W. Barometer, 29.8; temperature of air, 56°; of water, 54°. Winds: N. N. W., S. E., S. S. E. First part, fine breeze and pleasant; middle, light and baffling; large swell from east; latter part, light and pleasant.

Jan. 11. Lat. 51° 25′ S.; long. 64° 50′ W. Barometer, 29.25; temperature of air, 56°; of water, 53°. Winds: E. N. E., N., W. S. W. First part, light and pleasant; barometer falling; middle part, fresh gales and rising sea; barometer still falling; latter part, hard gales and heavy sea. I notice that the sea rises fast in this neighborhood.

Jan. 12. Lat. 53° S.; long. 64° 14′ W. Current, E. N. E., ¾ knot per hour. Barometer, 29.6; temperature of air, 54°; of water, 46°. Wind: W. S. W. First part, strong breezes; middle, strong gales, large sea; ship laboring very much; very cold; barometer gradually rising; latter part, pleasant.

Jan. 13. Lat. by the land, 54° 45′ S.; long. by the land, 63° 42′ W. Current, 2 knots per hour, N. N. W. Barometer, 29.4; temperature of air, 54°; of water, 45°. Winds: W. S. W., W. N. W., W. by N. First part, moderate and pleasant; smooth sea; middle, strong breezes. The sea has the appearance of a strong current tumbling about like breakers. At 9 A. M. east end of Staten Land bearing south by compass. Ends strong breezes and misty.

Jan. 14. Lat. 56° 16′ S.; long. 62° 54′ W. Current, 2 knots per hour, E. N. E. Barometer, 29.55; temperature of air, 52°; of water, 44°. Winds: W. S. W., S. W., S. W. First part, fresh breezes; appearance of strong current; middle, fresh gales; water smooth; latter part, fresh gales and squally.

Jan. 15. Lat. (D. R.) 57° 7′ S.; long. (D. R.) 63° 4′ W. Barometer, 29.15; temperature of air, 52°; of water, 44°. Winds: N. by W., W., N. by W. Fresh breezes and smooth; middle part, moderate and misty; latter, light and foggy; heavy swell.

Jan. 16. Lat. (D. R.) 57° 10′ S.; long. (D. R.) 63° 30′ W. Barometer, 29.15; temperature of air, 48°; of water, 44°. Winds: W., S. S. W., S. S. W. First part, moderate and rainy; S. W. swell; barometer falling; middle, fresh and rainy; barometer continues to fall until 11 P. M., then 28.75. After midnight, it rose again without much increase of wind; latter part, light breeze; tremendous heavy swell from W. S. W. Can this have been a gale to the westward of us which caused the fall of the barometer? It certainly has been blowing hard to cause all this sea.

Jan. 17. Lat. 57° 57′ S.; long. 63° 50′ W. Current, 90 miles easterly, since last observation.

Barometer, 29.48; temperature of air, 49°; of water, 43°. Winds: S., S., S. W. Moderate and cloudy, with heavy sea from S. W.; cold; middle part, light and baffling; ends pleasant.

Jan. 18. Lat. 58° 50′ S.; long. 66° 33′ W. Current, $\frac{3}{4}$ knot, east. Barometer, 28.9; temperature of air, 52°; of water, 43°. Winds: N. W., N. N. W., calm. First part, moderate and pleasant; heavy swell from the westward; middle part, fresh, thick, and rainy; ends light airs and calms; foggy.

Jan. 19. Lat. (D. R.) 59° 10′ S.; long. 66° 31′ W. Current, 1 knot east, per hour. Barometer, 28.9; temperature of air, 50°; of water, 43°. Winds: calm, calm, N. N. W. First and middle parts calm, heavy swell from westward; ends light breezes. The barometer has remained nearly stationary.

Jan. 20. Lat. 59° 46′ S.; long. 67° 08′ W. Current, 1 knot per hour, east. Barometer, 28.9; temperature of air, 48°; of water, 42°. Winds: N. N. W., S. W., W. S. W. First part, moderate breezes and rainy—very cold; ends light breeze and pleasant. A heavy swell from the westward. Barometer remains low all the time; it appears to be of no use here, though I will continue to use it for your gratification.

Jan. 21. Lat. (D. R.) 59° 56′ S.; long. (D. R.) 69° 28′ W. Barometer, 28.75; temperature of air, 48°; of water, 41°. Winds: W., N., E. First and middle parts, light winds and pleasant; latter part, strong breezes and rainy; not so much westerly swell. Barometer, all the time very low.

Jan. 22. Lat. 59° 36′ S.; long. 73° 52′ W. Barometer, 29.3; temperature of air, 53°; of water, 43°. Winds: S. E., S., S. S. W. Throughout moderate breezes; quite smooth.

Jan. 23. Lat. 59° 18′ S.; long. 75° 00′ W. Current, $\frac{3}{4}$ knot, E. N. E. Barometer, 29.5; temperature of air, 56°; of water, 43°. Winds: S. W., calm, N. W. Light breezes and pleasant.

Jan. 24. Lat. 59° 32′ S.; long. 78° 48′ W. Current, 1 knot, E. S. E. Barometer, 29.4; temperature of air, 48°; of water, 43°. Winds: N. W., N. W., N. N. W. Moderate breezes and pleasant. Heavy westerly swell.

Jan. 25. Lat. (D. R.) 59° 14′ S.; long. (D. R.) 82° 10′ W. Barometer, 28.8; temperature of air, 48°; of water, 43°. Winds: N. N. W., N., S. W. First part, strong breezes; middle, quite moderate, squally; ends, blowing hard gales; cold, rainy weather.

Jan. 26. Lat. (D. R.) 58° 23′ S.; long. (D. R.) 82° 53′ W. Barometer, 29.05; temperature of air, 48°. of water, 43°. Winds: S. W., calm, N. N. W. First part, gales and high sea; but moderating towards the last. Middle part, light, westerly airs; latter part, moderate breezes, thick and rainy.

Jan. 27. Lat. 57° 40′ S.; long. 83° 54′ W. Current, 30 miles, E. S. E. since last observations. Barometer, 29.3; temperature of air, 48°; of water, 44°. Wind: W. S. W. Fresh breezes, thick and rainy; blowing in flaws quite strong; a westerly swell.

Jan. 28. Lat. 55° 52′ S.; long. 84° 41′ W. Current, 1 knot, east. Barometer, 29.65; temperature of air, 48°; of water, 44°. Winds: S. W., W. S. W., S. W. by W. First part, strong gales and squally; heavy westerly swell. Middle part, more moderate; latter part, fresh breezes and squally. You will observe that the barometer is gradually ranging higher as we decrease our latitude.

Jan. 29. Lat. 54° 34′ S.; long. 86° 13′ W. Current, none. Barometer, 29.6; temperature of air,

48°; of water, 44°. Winds: S. W., calm, N. N. E. First part, fresh breezes and pleasant; middle part, light airs and calms; latter part, fresh and cloudy.

Jan. 30. Lat. 52° 11′ S.; long. 89° 08′ W. Current, none. Barometer, 29.8; temperature of air, 51°; of water, 47°. Winds: N. N. E., E. S. E., S. S. W. Strong breezes; high sea; close reefs; middle part, blowing heavy in squalls; ends more moderate; barometer rising.

Jan. 31. Lat. (D. R.) 50° 46′ S.; long. (D. R.) 89° 09′ W. Barometer, 29.8; temperature of air, 50°; of water, 47°. Winds: W. by S., W., N. N. W. First part, fresh and squally; heavy swell from S. W.; middle part, moderate; latter, fresh and squally.

Feb. 1. Lat. 50° 15′ S.; long. no observation. Current, 36 miles, E. N. E. since last observation. Barometer, 29.3; temperature of air, 52°; of water, 48.° Winds: N., N. W., and W. First part, strong gales and disagreeable weather; turbulent sea from N. W.; appearance of a strong current; middle part, the same; latter, strong breezes and hazy.

Feb. 2. Lat. 48° 50′ S.; long. 90° 00′ W. Current, E., one knot per hour. Barometer, 29.4; temperature of air, 52°; of water, 50°. Winds: W. S. W., W., W. S. W. First and middle parts, fresh breezes with heavy sea from N. W.; latter part, strong breezes with large swell from S. W. We have had a constant current from the westward, amounting to 530 miles since leaving this latitude on the other side. The barometer does not appear to act yet. I think a ship in this part of the world is much better without one, for it causes a deal of anxiety, and uneasiness of mind to the master.

Ship Tingqua (S. D. Whitmore).

Jan. 15, 1853. Lat. 55° 20′ S.; long. 65° 35′ W. Barometer, 29.50; temperature of air, 58°; of water, 46°. Winds: First part, baffling; middle part, calm; latter part, W. N. W. Commences with light airs from N. W.; middle part, calm; latter part, fresh breezes and pleasant. At 4 P. M. made Cape St. Inez, S. W. by W., 30 miles. At 4 A. M. passed within one cable's length of Cape St. Diego, low water. No rip off the capes as I have found heretofore, owing to the tide being with the wind. At 5 A. M. passed close to Good Success Bay. The American barque Virginian getting under way, standing out. He reports leaving New York five days before me; by the papers, it is near twenty-five; he got a good supply of wood and water at Good Success Bay. At 10 A. M. clear of the straits; met the tide; wind dying away; at noon calm, with light rains; Cape Good Success, N. by E., N. I. Islands W. by S.; strong flood tide; appearances of wind from the S. W.; barometer falling fast; sent dow skysail yards and royal studding-sail booms. This gives us fifty-two days out. With an ordinary chance since leaving the river, it might have been forty-five days; but, since then, our latitude has been a hard one, and I think, at this season of the year, there is no need of keeping so close to the land after leaving Cape St. Augustine to the river Plata; but, since then, I found, as I increased my distance from the land, the winds are less favorable and not so strong. If there is any advantage in keeping in shore, I am sure I have had it this passage; however, I shall compare logs with other vessels on my arrival at San Francisco, and inform you.

Jan. 16. Lat. 56° 37′ S.; long. 64° 20′ W. Temperature of air, 58°; of water, 44°. Variation, 29°

40′. Commences calm; barometer falling; at 6, a light breeze from the S. W.; middle part, strong breezes and a heavy sea; ship laboring heavily; latter part, fresh gales from the S. W.; sea more regular.

Jan. 17. Lat. 55° 35′ S.; long. 65° 15′ W. Temperature of air, 48°; of water, 46°. Variation, 29° 40′. Wind: first part, fresh gales from the S. W.; exchanged colors with an American whale ship; middle part, wind, south; latter part, more moderate; wind, S. S. W.; saw a large school of sperm whales.

Jan. 18. Lat. 56° 38′ S.; long. 68° 00′ W. Barometer, 29°; temperature of air, 50°; of water, 46°. Commences with light winds from the N. W., and ends with light winds from S. W.; north point of land, S. S. W.; sugar-loaf on Terra del Fuego, N. by W., current having set us to the northward and eastward 40 miles during the last twenty-four hours. At 10 P. M., Hermit's Isle bore west five miles; steered S. ½ E. for Barnevelt's Rocks, going eight knots; thick weather; saw nothing; presume passed to the eastward of them.

Jan. 19. Lat. 56° 52′ S.; long. 67° 30′ W. Barometer, 28.5; temperature of air, 44°; of water, 43°. Winds: first part, S. W. light; middle and latter parts, W. Boarded by the captain of an American whaler, who reports light west winds, and thick rainy weather during the last ten days. Preparing for a S. W. blow.

Jan. 20. Lat. 56° 52′ S.; long. 68° 15′ W. Barometer, 29.00 falling; temperature of air, 43°; of water, 47°. Wind: moderate, from the westward all day. At 10 A. M. saw Diego Ramirez, S. W. by S. by compass, distant 20 miles. Standing close in, to take advantage of slants.

Jan. 21. Lat. 57° 07′ S.; long. 70° 00′ W. Barometer, 28.60; temperature of air, 46°; of water, 43°. First part, a moderate W. N. W. wind, heading as we draw near the land. At 2 P. M. made the land, distant 15 miles; very hazy; indications of a northerly wind. At 4. P. M. tacked 4 miles from the land. At 5 P. M. calm. Current setting to the eastward about ½ a knot. Middle part, N. N. W. At 6 P. M. breeze sprung up at N., increased, hauled to N. E., and back to N. N. W. Latter part, wind W. N. W.; first of it a double-reefed topsail breeze; latter, light breezes and fine weather; tacked ship, all sail. Barometer, 28.60; for my part, I put more confidence in the temperature of the water, than in anything else in these latitudes, as I have not been deceived as yet, especially as regards shifts, rising previous to south and west winds, and *vice versâ*.

Jan. 22. Lat. 55° 23′ S.; long. 74° 15′ W. Barometer, 29; temperature of air, 44°; of water, 45°. First part. Winds: S. S. W.; middle and latter parts, S. W. Fresh gales and a heavy sea; carrying top-gallant-sail over single reefs.

Jan. 23. Lat. 55° 37′ S.; long. 74° 12′ W. Barometer, 29.30; temperature of air, 53°; of water, 44°. Winds: first part, west and fresh; middle and latter parts, baffling; quite a change in the weather. Spoke the brig Mars, 24 days from Valparaiso; a long passage; land in sight to leeward; tacked ship to southward; Cape Gloucester bearing E. N. E. 10 miles.

Jan. 24. Lat. 55° 07′ S.; long. 77° 25′ W. Barometer, 29.10; temperature of air, 52°; of water, 42°. Winds: first, N.; middle, N. W; latter, N. N. E. Baffling winds and cloudy; saw sperm whales in schools. Ends rainy.

Jan. 25. Lat. 55° 00′ S.; long. 80° 24′ W. Barometer, 29; temperature of air, 54°; of water, 43°. Winds: first part, N. N. W.; middle, N. W.; latter, W. N. W. Strong winds, and dark cloudy weather. At 8 P. M. wind heading; appearances of a change. At 4 A. M. wore ship to the N.; think I am clear of Cape Horn; heavy irregular sea; wind heading us to N. N. E. 2 hours, when it came back to its old quarter.

Jan. 26. Lat. 52° 30′ S.; long. 80° 30′ W. Barometer, 29.30; temperature of air, 48°; of water, 44°. Wind: strong from W. N. W. during the day, with dark cloudy weather.

Jan. 27. Lat. 49° 15′ S.; long. 80° 32′ W. Barometer, 29.75; temperature of air, 54°; of water, 50°. Wind and weather same as yesterday.

Jan. 28. Lat. 46° 20′ S.; long. 80° 30′ W. Barometer, 29.80; temperature of air, 60°; of water, 58°. Dark cloudy weather, with a W. N. W. wind. Barometer rose until 2 P. M. and there stopped.

Alboni (N. R. Littlefield).

Jan. 18, 1853. Lat. 54° 37′ S.; long. 64° 55′ W. Barometer, 28.20; temperature of air, 40°; of water, 41°. Winds: W., W. S. W., S. First part, light; middle, fresh gales, very thick. At 11 A. M. entered the Straits of Le Maire; very heavy squalls from the S., and thick, which ended in a heavy gale.

Jan. 19. Lat. 54° 33′ S.; long. 63° 40′ W. Current, 28 miles, E. Barometer, 28.10; temperature of air, 39°; of water, 40°. Winds: S. S. W., S. W., S. W. First part, heavy gale, with much rain; the land entirely shut in; middle and latter, thick and rainy. At 9 P. M. Cape St. John in sight, bearing S. W., 19 miles distant.

Jan. 20. Lat. 55° 10′ S.; long. 62° 52′ W. Current, 20 miles, east. Barometer, 28.30; temperature of air, 40°; of water, 41°. Wind: S. W. Fresh gales, with much rain.

Jan. 21. Lat. 56° 20′ S.; long. 63° 35′ W. Current, 10 miles, east, for the day. Barometer, 28.40; temperature of air, 41°; of water, 41°. Winds, S. W., calm, W. N. W. First part, fresh; ends, fresh and squally.

Jan. 22. Lat. 57° 20′ S.; long. 65° 20′ W. Barometer, 28.60; temperature of air, 41°; of water, 40°. Winds: W., S. W., S. S. W. First part, fresh; middle, very heavy squalls; latter, fresh; large sea from S. W.

Jan. 23. Lat. 56° 36′ S.; long. 65° 20′ W. Barometer, 28.00; temperature of air, 40°; of water, 41°. Winds: S. W. by W., S. W., S. S. W. First part, fresh gales; middle, heavy gales; latter, fresh rain squalls.

Jan. 24. Lat. 56° 36′ S.; long. 65° 20′ W. Barometer, 29.00; temperature of air, 38; of water, 40°. Winds: S. W., calm, N. E. First part, fresh and clear; latter, very light and cloudy.

Jan. 25. Lat. 57° 27′ S.; long. 71° 26′ W. Barometer, 29.10; temperature of air, 42°; of water, 40°. Winds: N. N. E., W. N. W., S. W. All day, light and pleasant; all sail set, to main skysail; Cape Horn in sight.

Jan. 26. Lat. 57° 07′ S.; long. 73° W. Barometer, 28.30; temperature of air, 40°; of water, 42°. Winds: W. S. W., S. W., S. W. Fresh and squally.

Jan. 27. Lat. 57° 00′ S.; long. 74° 15′ W. Barometer, 29.00; temperature of air, 42°; of water, 41°. Winds: S. W. by W., S. W., S. W. Fresh, with rain squalls.

Jan. 28. Lat. 55° 39′ S.; long. 75° 48′ W. Barometer, 28.50; temperature of air, 42°; of water, 40°. Winds: W. S. W., W. S. W., S. W. Fresh gales and rain squalls.

Jan. 29. Lat. 54° 44′ S.; long. 76° 35′ W. Barometer, 28.40; temperature of air, 43°; of water, 41°. Winds: N. E., south, south. First part light; middle, wind canted suddenly to south, and blew a furious gale. Lost the foretopsail.

Jan. 30. Lat. 52° 49′ S.; long. 82° 00′ W. Barometer, 28.00; temperature of air, 58°; water, 40°. Winds: S. S. W., south, W. S. W. First part, heavy gale; middle, fresh gale; latter, strong gale, with rain. I now consider that we are fairly past Cape Horn, and never, in one instance, has my barometer deceived me.

Jan. 31. Lat. 50° 36′ S.; long. 83° 45′ W. Barometer, 29.15; temperature of air, 51°; of water, 42°. Winds: W., W. S. W., W. S. W. First part, fresh gales; middle and latter, strong gales, thick and cloudy.

Feb. 1. Lat. 50° 00′ S. long. 85° 13′ W. Barometer, 29.00; temperature of air, 52°; of water, 47°. Winds: W. by N., N. N. W., W. S. W. First part, light; middle and latter, fresh, thick, and rainy.

Capt. Phinney, of the Kentucky, to Lieut. Maury.

Herewith inclosed you have an abstract of my passage—ship Kentucky. It will be seen that I had good N. E. trades, and lost them in about 5° N., 30° 20′ W.; 19 days from Boston; an old-fashioned ship, and very deep; that I had very little calm or rain, but almost immediately took the S. E. trades, light and baffling, crossed the equator in 32° 40′, 24 days out; wind, S. E.; made two short tacks to eastward in the vicinity of Rocas; passed 17 miles west of same, and cleared St. Roque in 27 days, running all one day near the land, in about 10 fathoms water; crossed the parallel of Rio in 36 days, and from thence to Cape Horn I had a very poor chance. Entered the Straits of Le Maire in 65 days, and in 70 was west of the cape, with but little bad weather, and no easterly current; neither did I feel that strong westerly set between the line and St. Roque, so much spoken of and feared.

From Cape Horn till I took the S. E. trades, in 35° S., 105° W., I was 36 days, with almost a constant succession of N. W. gales.

I crossed the line in 113° 10′ W., 122 days out; took the N. E. trades in 5° N., and lost them in 26° 00′; after which, my prevailing wind was farther southward, but light and baffling; and soon calms; arrived in port this day, making my passage in 147 days.

In conclusion, I cannot refrain from expressing my sense of the benefit I feel that your labors have already conferred upon the commercial world; and also, my hope that you may be permitted to follow up these researches and investigations, by which, I believe, navigation will in a few years become quite a different matter from what it has been in times past.

Ship Kentucky.

Jan. 28, 1853. Off Cape San Diego, Straits of Le Maire. Barometer, 29.30. Wind: S. W.; squally, variable, and bad weather. At daylight, made the land; Cape St. Vincent bearing S. S. E. Entered the Straits of Le Maire as far as Cape San Diego; the wind veering to S., and blowing violently in squalls; wore ship and stood out; two barques in company—all under close reefs; bad weather.

Jan. 29. Off Cape Good Success. Barometer, 29.40. Winds: S. W., S. W., W. S. W. Hard gales and violent squalls. At daylight, run through as far as Cape Good Success, when the wind veering to S. W., blowing violently, and a heavy sea, wore ship, and stood back again.

Jan. 30. Off Cape San Diego. Winds: W. S. W., S. S. W., S. S. W.; laying under lee of Cape St. Vincent; violent squalls and hard gales. In the morning, calm, with light airs from N. E. Made all sail, and entered the straits. Spoke barque Gold Hunter, of and from Bath, *ninety days out;* we are *sixty-seven.* Ends off San Diego.

Jan. 31. Cape Horn bearing W. S. W., 40 miles distant. Winds: E., E. S. E., calm. Light airs from the eastward, and fine. At 8 A. M. made Cape Horn. Ends calm.

Feb. 1. Cape Horn bearing W. by S. ½ S., distant 20 miles. Winds: W. N. W., W. S. W., W. S. W.; moderate, baffling winds during the night; latter part, squally, with hail.

Feb. 2. Cape Horn bearing N. by W., distant 25 miles. Barometer, 29.40. Winds: calm, calm, N. E., baffling; calm, baffling, squally weather; latter part, light breeze from N. E. I have experienced no easterly current off the cape, yet. Barometer, useless.

Feb. 3. Lat. 56° 24′ S.; long. 71° 10′ W. Barometer, 28.96; Winds: N. E., N. E. by E., N. N. W. Good breezes; latter part, moderate and baffling; calm, showery, light weather.

Feb. 4. Lat. 56° 24′ S.; long. 72° 43′ W. Barometer, 28.94. Winds: N. N. W., S. W., N. N. W. Fine weather; middle and latter parts, calm, baffling, and rainy. Ends fine.

Feb. 5. Lat. 56° 07′ S.; long. 73° 55′ W. Barometer, 29.10. Winds: N., calm, calm. Calms and light baffling airs. Large swell from N. W.

Feb. 6. Lat. 55° 49′ S.; long. 75° 02′ W. Barometer, 29.50. Winds: S. W., W. S. W., W. Light airs throughout; heavy swell from N. W.

Feb. 7. Lat. 55° 04′ S. (D. R.); long. 77° 01′ W. (D. R.) Barometer, 29.55. Winds: W., S. W. by W., W. S. W. Moderate, cloudy, and squally. Tacked to north at midnight.

Feb. 8. Lat. 53° 35′ S.; long. 77° 24′ W. Current, 1 knot per hour, E. Barometer, 29.52. Winds: W., W. by N., W. N. W. Moderate and rainy. In the morning brisk gale, and large sea from N. W.

Feb. 9. Lat. 54° 11′ S.; long. 78° 56′ W. Barometer, 29.30. Winds: W. N. W., W., W. S. W. Hard gales and high sea. Ends moderate, and *thick fog.*

Feb. 10. Lat. 53° 05′ S. (D. R.); long. 80° 26′ W. (D. R.) Barometer, 29.20. Winds: N. W., N. W. N. W. by W. Strong gales, and thick, rainy weather.

Feb. 11. Lat. 53° 55′ S.; long. 82° 00′ W. Barometer, 28.90. Wind: N. W. Hard gales, and squally. Two ships in company.

Feb. 12. Lat. 53° 15′ S.; long. 82° 00′ W. Current, 1 knot per hour, E. Barometer, 29.30. Winds: W. N. W., W., W. N. W. Hard gales, and squally. Latter part, nearly calm.

Feb. 13. Lat. 53° 53′ S.; long. 83° 10′ W. Current, ½ knot per hour, E. by S. Barometer, 29.10. Winds: W. N. W., W. N. W., W. by N. Tremendous gales, and very bad sea.

Feb. 14. Lat. 52° 55′ S.; long. 82° 30′ W. Current, ½ knot, E. Barometer, 29.20. Wind: W. by N. Violent gales, and hard squalls of rain and hail all day.

Feb. 15. Lat. 52° 05′ S.; long. 82° 45′ W. Current, 1 knot, E. S. E. Barometer, 29.10. Winds: W. N. W., calm, W. S. W. Hard gales. At 6 P. M. calm. Latter part, hard gales from same old quarter.

Feb. 16. Lat. 51° 31′ S.; long. 82° 30′ W. Current, ½ knot, E. Winds: W. S. W., W., W. N. W. Hard gales and bad sea all day.

Feb. 17. Lat. 50° 48′ S.; long. 82° 30′ W. Current, ½ knot, E. S. E. Winds: W. by S., W. S. W., W. S. W. Hard gales and bad sea.

San Francisco, *April* 11, 1853.

Lieut. Maury: I herewith send my abstract log of my passage to this port, and I am happy to say, that I feel indebted to your Charts and Directions for my short passage. I crossed the line in 35° 30′ in less than 18 days from New York, and had no difficulty in beating past Cape St. Roque the 25th day out, and I have beaten everything that sailed about the time I did. It was my intention to go inside the Falkland Islands, but the weather prevented me, and I find, since my arrival, that, by going outside, I gained considerably on other vessels.

I expect to leave here for Manilla; and regret that I have not similar means of knowing the winds and phenomena of the Pacific, that your Charts give of the Atlantic. I shall forward my next abstract, and think it a slight testimonial for the benefit received.

Clipper Barque Storm (John P. Roberts), New York to San Francisco.

Jan. 31, 1853. Lat. 40° 49′ S.; long. 44° 09′ W. Barometer, 29.90; temperature of air, 59°; of water, 61°. Winds: S. W. during first part; middle and latter part, S. S. W., and N. E. First part, moderate winds and a heavy sea. At 6 P. M. wore ship to the W. by N.; middle part, calm; latter part, moderate breezes from the northeast. Observation, S. 67° W. Distance, 63 miles. I think I have missed it by not running close to Cape Frio, and running the coast down, as it appears to be a dead beat to windward from where we are now. The Pilot Charts give me the chance for fair winds against head ones, in the proportion of about 3 to 2, for making a course from W. S. W. to S. S. W. The results will show how near it comes to the mark. Forty-one days out.

Feb. 1. Lat. 42° 40′ S.; long. 46° 53′ W. Barometer, 29.17; temperature of air, 65°; of water, 56°. Winds: during first and middle part, N. E. by E.; latter part, W. S. W. First and middle parts, fair and all sail set; latter part, heavy gales; ship under double reefs. Although various navigators agree in say-

ing that the barometer is not to be relied on in these latitudes, mine, thus far, has been an unfailing guide. Observation, S. 48° W. Distance, 166 miles.

Feb. 2. Lat. 44° 27′ S.; long. 47° 38′ W. Barometer, 29.85; temperature of air, 56°. Winds: W. S. W., W. N. W., W. S. W. Blowing heavy and a high sea running. Wore ship to N. W. Distance, by observation, 112 miles S., 17° W.

Feb. 3. Lat. 43° 08′ S.; long. 48° 20′ W. Wind: W. S. W., throughout. Heavy gales first and middle parts; latter part, moderate. At 8 A. M. tacked to the south. Distance, by observation, 84 miles N., 20° W.

Feb. 4. Lat 44° 27′ S.; long. 50° 17′ W. Barometer, 29.30. Winds: N. E., N. W., S. S. W. First part, moderate; middle, heavy thunder squalls, with most vivid lightning; latter part, fair, moderate wind. Tacked at 4 A. M. to west; water dark green. Distance, by observation, 116 miles S., 47° W.

Feb. 5. Lat. 46° 28′ S.; long. 52° 20′ W. Barometer, 29.00. Winds: N. W., W., W. S. W. First and middle parts, fine; latter part, heavy gales; weather clear and cold. Distance, by observation, 166 miles S., 31° 30′ W.

Feb. 6. Lat. 48° 47′ S.; long. 53° 00′ W. Barometer, 29.50. Wind: W. S. W. throughout. First and middle parts, strong gale; latter part moderate. Distance, by observation, 122 miles S., 13° W.

Feb. 7. Lat. 49° 25′ S.; long. 53° 40′. Barometer, 29.60. First and middle parts, calm; latter part, wind all round the compass; morning rainy, and wind east two hours; at noon, a fresh west wind, with a dense fog. Distance, by observation, 47 miles S., 36° W.

Feb. 8. Lat. 51° 00′ S.; long. 56° 45′ W. Barometer, 29.70. Winds: W. to S. E., S., W. Commences with foggy weather and fresh breeze. At 4 P. M. wind changed to S. E.; at midnight, tacked to S. S. E. Morning, fresh breeze and hazy weather. Passed some kelp. Distance, by observation, 152 miles S., 41° W.

Feb. 9. Lat. 52° 05′ S.; long. 57° 45′ W. Barometer, 29.70. First part, fine breeze from S. by W., and pleasant; at 4 P. M. tacked to W. by S.; at 8 P. M. to S. S. E.; daylight, made the land west, ten miles; saw numerous whales, penguins, and kelp. Middle part, calm; latter part, west; hauled to N. E. at noon, with fine weather. Distance, by observation, 75 miles S., 30° W.

Feb. 10. Lat. 54° 18′ S.; long. 61° 30′ W. Current, 1½ knot per hour, N. E. Barometer, 29.37. Winds: N. N. W., N. W., W.; fine weather and moderate breeze. At 11 P. M. passed within five miles of Beauchure Island to the S. Morning, thick fog; saw whales. Distance, by observation, 190 miles S., 45° 30′ W.; by log, 190 miles.

Feb. 11. Lat. 55° 01′ S.; long. 63° 14′ W. Barometer, 29.40. Winds: S. S. W., calm, W. N. W.; fair weather, moderate breeze. At 2 P. M. tacked to the westward; at daylight, saw Staten Land, bearing W. S. W. 30 miles; at 10 A. M. passed through a strong tide rip, running N. W. and S. E. Distance, by observation, 74 miles S., 54° W.

Feb. 12. Lat. 56° 44′ S.; long. 67° 03′ W. Barometer, 29.04. Winds: W. N. W., W. N. W., W. to S. W. First and middle parts, fine; at 8 A. M. Cape Horn bore W. N. W. fifteen miles. Latter part,

strong gale; a heavy swell from the westward. Distance, by observation, 164 miles S., 51° W.; by log, 230 miles.

Feb. 13. Lat. 56° 50′ S.; long. 68° 35′ W. Barometer, 29.36. Winds: W., W. S. W., N. W. by W. First part, strong gales from west; spoke the brig Alfonso, 85 days from Boston for San Francisco; at 8 P. M. tacked to N. W.; at 4 A. M. tacked to S. W. Ends with strong breeze, rainy weather, and heavy sea. Distance, by observation, 50 miles W., 7° S. Fifty-four days out.

Feb. 14. Lat. 58° 08′ S.; long. 71° 11′ W. Barometer, 29.00. Winds: N. W., W. by N., W. N. W. First part, a heavy squall; middle part, more moderate. Spoke the barque A. F. Jenness, 138 days from Philadelphia, *via* Rio Janeiro, 46 days, bound to San Francisco. Ends with fine weather. Distance, by observation, 116 miles S., 47° W.

Feb. 15. Lat. 59° 07′ S.; long. 74° 15′ W. Barometer, 28.80. Winds: W. N. W., W. N. W., baffling from W. N. W. to W. First and middle parts, cloudy weather and moderate breeze. Latter part, light, changeable airs, and hail squalls. Ends calm. Barometer, low, and falling. Distance, by observation, 114 miles S., 58° W.

Feb. 16. Lat. 57° 43′ S.; long. 74° 55′ W. Barometer, 28.73. Winds: calm, S. W. First part, calm; middle part, strong gale. Morning, light airs, and cloudy. Distance, by observation, 114 miles S., 59° W.

Feb. 17. Lat. 56° 24′ S.; long. 76° 32′ W. Barometer, 28.70. Winds: S. W., S. W., N. W. First and middle parts, moderate breezes, and thick, threatening weather. Morning, light wind; at 10 A. M. tacked W. S. W. Ends with strong breeze. Distance, by observation, 95 miles N., 33° W.

Feb. 18. Lat. 55° 05′ S.; long. 77° 20′ W. Barometer, 29. Winds: W., N. W., W. S. W. First and middle parts, fresh breeze; tacked twice; latter part, squally. Spoke the Chilian ship Jesus Ramos. She reported speaking the Jacob Bell (clipper) on the 16th. She left New York nine days before us. Distance, by observation, 84 miles N., 19° W.

Feb. 19. Lat. 52° 9′ S.; long. 78° 18′ W. Barometer, 29.50. Winds: W. S. W., W., W. S. W. Heavy and frequent squalls and a high sea. Weather cold and cloudy. Distance, by observation, 220 miles N., 23° W.

A. F. Jenness (S. B. Horton).

Feb. 3, 1853. Lat. 51° 30′ S.; long. 67° 4′ W. Barometer, 29.15. Winds: E. N. E., N., N. N. W.

Feb. 5. Lat. 53° 52′ S.; long. 66° 30′ W. Barometer, 29.20. Winds: N. E., E., and E. S. E. Wind: light; weather variable.

Feb. 7. Lat. 55° 18′ S.; long. 63° 30′ W. Barometer, 29.40. Winds: N. E., N., and N. W.

Feb. 9. Lat. 56° 34′ S.; long. 65° 40′ W. Current, 24 miles, easterly. Barometer, 29.20. Winds: W., S. W., and N. W.

Feb. 11. Lat. 57° 8′ S.; long. 68° W. Barometer, 29.05. Winds: N. W., W., and S. W.

Feb. 13. Lat. 57° 50′ S.; long. 70° 10′ W. Barometer, 29.08. Winds: N. W., W. S. W., and W. N. W. Moderate breezes.

Feb. 15. Lat. 58° 42′ S.; long. 72° 50′ W. Barometer, 28.78. Winds: N. W., W., and N. W.

Feb. 17. Lat. 57° 7′ S.; long. 75° 40′ W. Barometer, 28.80. Winds: E., W. N. W., and S. W. Light and baffling.

Feb. 19. Lat. 56° 2′ S.; long. 75° 50′ W. Barometer, 29.15. Winds: N. W., S. W., and W.

Feb. 21. Lat. 53° 54′ S.; long. 78° 40′ W. Barometer, 29.85. Winds: E. N. E., S. S. E., and W. S. W.

Feb. 23. Lat. 51° 40′ S.; long. 80° W. Barometer, 29.30. Winds: W. S. W., N. W., and N. N. W.

Feb. 25. Lat. 49° 55′ S.; long. 80° 5′ W. Barometer, 29.60. Winds: N., W. N. W., and N. W.

Flying Childers (J. D. White).

Feb. 7. Lat. 48° 55′ S.; long. 64° 10′ W. Temperature of air, 50°; of water, 48°. Winds: N. E., N. E., S. Throughout this day moderate.

Feb. 8. Lat. 51° 44′ S.; long. 65° 22′ W. Temperature of air, 50°; of water, 48°. Winds: W., W., W. Moderate throughout.

Feb. 9. Lat. 54° 15′ S.; long. 65° 10′ W. Temperature of air, 51°; of water, 48°. Winds: W., W., W. Moderate throughout.

Feb. 10. Lat. 56° 30′ S.; long. 65° 15′ W. Temperature of air, 48°; of water, 45°. Winds: W., W. to S. and to E., W. S. W. Passed through the Straits of Le Maire.

Feb. 11. Lat. 58° 5′ S.; long. 67° 1′ W. Temperature of air, 43°; of water, 45°. Winds: S. W., N. W., S. W. Moderate; smooth sea.

Feb. 12. Lat. 58° 26′ S.; long. 71° 20′ W. Temperature of air, 42°; of water, 43°. Winds: N. W., N. W., N. W. Moderate, with a smooth sea.

Feb. 13. Lat. 58° 35′ S.; long. 75° 20′ W. Temperature of air, 43°; of water, 42°. Winds: W., N. W., N. N. W. Moderate breezes.

Feb. 14. Lat. 59° 27′ S.; long. 77° 1′ W. Temperature of air, 42°; of water, 42° Winds: N. N.W., N. W., W. Moderate breezes.

Feb. 15. Lat. 58° 57′ S.; long. 77° 44′ W. Temperature of air, 42°; of water, 42°. Winds: W., W., W. Strong breezes, with hail squalls.

Feb. 16. Lat. 58° 8′ S.; long. 77° 44′ W. Temperature of air, 42°; of water, 42°. Winds: W., W., W. Light airs and calm.

Feb. 17. Lat. 56° 55′ S.; long. 78° 35′ W. Temperature of air, 43°; of water, 42°. Winds: W., W., W. Light airs and calm.

Feb. 18. Lat. 55° 7′ S.; long. 79° 30′ W. Temperature of air, 43°; of water, 44°. Winds: W., W., W. Light airs and calm.

Feb. 19. Lat. 51° 34′ S.; long. 80° 20′ W. Temperature of air, 41°; of water, 46°. Winds: W. S. W., W. S. W., W. S. W. Fresh breezes and squally.

Feb. 20. Lat. 47° 40′ S.; long. 82° 30′ W. Temperature of air, 46°; of water, 50°. Winds: S. W., S. W., S. W. Strong breezes and squally until 8 A. M. Ends calm.

Winged Racer (Wm. Homans), Boston to San Francisco.

Jan. 30, 1853. Lat. 49° 37′ S.; long. 65° 46′ W. Barometer, 28.9; temperature of air, 52°; of water, 50°. Winds: S., W., N.

Jan. 31. Lat. 51° 12′ S.; long. 66° 8′ W. Barometer, 28.6; temperature of air, 50°; of water, 48°. Winds: N., S. W., S.

Feb. 1. Lat. 52° 16′ S.; long. 65° 10′ W. Barometer, 28.6; temperature of air, 50°; of water, 48°. Winds: S., S., S.

Feb. 2. Lat. 53° 12′ S.; long. 65° 12′ W. Barometer, 29.1; temperature of air, 46°; of water, 47°. Winds: S. W., calm, calm.

Feb. 3. Lat. 55° 23′ S.; long. 66° 1′ W. Barometer, 28.7; temperature of air, 46°; of water, 47°. Winds: E., N. N. E., N. At 5 A. M. made the land west side Straits of Le Maire, bearing S. by W. by compass. The Bell Mountain twenty-five miles distant; strong breezes at north, and west end Staten Land plain in sight. Two barques, bound through the straits to southward, in sight. At 8 A. M. Cape Good Success, bearing N. W. by N. five miles; a very strong tide setting to northward.

Feb. 4. Lat. 56° 43′ S.; long. 68° 35′ W. Barometer, 28.6; temperature of air, 52°; of water, 49°. Winds: N. N. E., W., N. E. At 8 P. M. Cape Horn in sight, bearing W. N. W. fifteen miles distant; 53 days from New York, and run a distance, by log, of 8,420 miles from New York to Cape Horn.

Feb. 5. Lat. 56° 50′ S.; long. 71° 20′ W. Barometer, 28.7; temperature of air, 50°; of water, 49°. Winds: N., N. W., N. W.

Feb. 6. Lat. 56° 32′ S.; long. 73° 2′ W. Barometer, 29.0; temperature of air, 47°; of water, 49°. Winds: S. S. E., S. S. E., W.

Feb. 7. Lat. 56° 7′ S.; long. 76° W. Barometer, 29.02; temperature of air, 46°; of water, 48°. Winds: W., S. W., W. S. W.

Feb. 8. Lat. 56° 11′ S.; long. 78° 30′ W. Barometer, 28.8; temperature of air, 46°; of water, 48°. Winds: W. by S., W. N. W., N. W. by N.

Feb. 9. Lat. 55° 46′ S.; long. 82° 46′ W. Barometer, 28.9; temperature of air, 46°; of water, 48°. Winds: N. W. by N., W. N. W., S.

Feb. 10. Lat. 54° S.; long. 82° W. Barometer, 29.8; temperature of air, 46°; of water, 48°. Winds: S., S. W., N. W.

Feb. 11. Lat. 53° 3′ S.; long. 82° 47′ W. Barometer, 28.7; temperature of air, 46°; of water, 48°. Wind: N. W. throughout.

Feb. 12. Lat. 51° 3′ S.; long. 82° W. Barometer, 28.6; temperature of air, 46°; of water, 48°. Wind: N. W. throughout.

Feb. 13. Lat. 50° S.; long. 82° W. Barometer, 29.0; temperature of air, 52°; of water, 48°. Wind: N. W. throughout.

On leaving New York, I followed your Directions as near as the wind and weather would allow, and crossed the equator in the Atlantic in long. 31° 16′, and found no difficulty in getting past the Brazil coast. Time to equator 21 days, 21 hours, and passed through the Straits of Le Maire; and off Cape Horn had light fine weather. Off the Horn, I tried to follow your Directions in getting west; but the wind prevented me, hanging to N. W. after around the Horn; and I passed about 3 degrees to west of Juan Fernandez. The S. E. trades I had far to the eastward, sometimes E. N. E., and from that to E. S. E.

Crossed the equator 7th March, 1853, 85 days out, in long. 106° 24′ west. Took N. E. trades in about 3 or 4, wind N. N. E. to N., and arrived off this bar, Sunday, 27th of March, in a thick fog, which continued until Wednesday, 30th, when it cleared up and I ran in.

I should follow your Directions again if I was coming round the Horn, as near as the wind and weather would permit me. Although I am of opinion that, with the wind I had in the South Atlantic, after passing lat. 38° south, had I gone to east of Falkland Islands, I think I should have gained some 5 days in the passage, and should have got in, in 100 days. I was 105 days to the bar.

I am going from this to Manilla and thence to New York; on my arrival at the latter port, I shall send an abstract from this to that port.

I take this opportunity to acknowledge the great benefit I have derived from your Charts and Directions, and shall most readily contribute what little I can to aid you in the great and good undertaking. We have been sadly in want of what you are now so happily doing in the way of Sailing Directions and Charts for this navigation, say from U. S. A. round the Horn into North Pacific.

Ship John Bertram (F. Lendholm).

Feb. 8, 1852. Lat. 54° 53′ S.; long. 62° 24′ W. Current, north, 22 miles. Barometer, 29.67. Winds: S. W., variable, variable. First part, moderate breezes and rainy weather; no prospects of clearing up, so as to get hold of the land; kept off to the eastward, and gave up the idea of going through the straits, which I was very sorry to do. In my opinion, every vessel bound around the cape should endeavor to go through the Straits of Le Maire [a good opinion], provided they can get a sure bearing of the land, to know their true position. I have been through three different times and found no difficulty, but gained a great advantage of being so much farther to windward; I have also strong reasons to think that there is better weather generally under the land, than off from it. At sundown, the weather clearing up, saw Staten Land, bearing S. W. ½ W., 5 leagues. Middle part, variable winds and squally weather, with rain; latter part, pleasant weather; a strong current setting to the north.

Feb. 9. Lat. 57° 24′ S.; long. 62° 28′ W. Current, E. by N., 37 miles. Barometer, 29.82. Winds:

S. W. by W., W. S. W., and S. W. by W. Throughout these 24 hours, fresh breezes and passing rain squalls.

Feb. 10. Lat. 55° 58′ S.; long. 64° 26′ W. Current, N. by E., 21 miles. Barometer, 29.80. Winds: S. W. by W., S. W. by W., and N. W. by W. First part, strong breezes and squally weather; under single reefs; middle part, gentle breezes and squally, with hail; morning, calm for three hours. At 6 A. M. a breeze sprang up from the N. W. by N., tacked to the S. W., and made all sail; latter part, light breezes and pleasant.

Feb. 11. Lat. 56° 09′ S.; long. 70° 20′ W. Current, east, 49 miles. Barometer, 29.62. Winds: N., N. by W., and N. by W. First part, fine breezes from the north, and pleasant weather; middle part, brisk breezes. At 1 A. M. Cape Horn bore per compass N. N. W., distant 5 miles. A strong current, by the appearance of the water, which I found to have set me 49 miles to the eastward, by meridian observation. At 4 A. M. saw Diego Ramirez Island, bearing S. W. by W. Latter part, fine breezes and heavy weather. At meridian, Island of St. Ildefonso bore, per compass, due north.

Feb. 12. Lat. 57° 00′ S.; long. 75° 17′ W. Current, east, 25 miles. Barometer, 29.70. Winds: N. N. W., N. N. W., W. Fine breezes and pleasant weather; evening, squally; middle part, strong breezes and squally, with hail, snow, and a head beat sea; latter part, strong breezes and squally, with a heavy head sea.

Feb. 13. Lat. 57° 42′ S.; long. 79° 08′ W. Current, east, 20 miles. Barometer, 29.82. Winds: W. N. W., N. W. by W., and N. W. First part, strong breezes and pleasant; middle part, moderate breezes and squally; wind variable, veering five or six points for several hours; latter part, fresh breezes and squally rainy weather.

Feb. 14. Lat. 55° 18′ S.; long. 81° 23′ W. Current, E. ½ N., 33 miles. Barometer, 30.10. Winds: N. N. W., S. W., and W. by S. Strong breezes, and rainy, squally weather. At 9 P. M. wind hauled suddenly to the S. W.; middle part, strong breezes and squally, with a heavy head sea; latter part, brisk breezes; wind inclining more to the westward, with an increasing sea from that quarter.

Feb. 15. Lat. 52° 59′ S.; long. 81° 12′ W. Current, E. by S., 18 miles. Barometer, 30.27. Winds: W. N. W., W. by S., and W. by S. First part, fine breezes and cloudy; middle and latter parts, moderate and pleasant, a heavy sea running from the west.

Feb. 16. Lat. 51° 12′ S.; long. 82° 20′ W. Current, none. Barometer, 30.53. Winds: S. W. by W., W. S. W., calm. First part, fine breezes and fine weather; middle part, light winds; latter part, calm and cloudy; little or no current; the log has probably not been strictly attended to.

Feb. 17. Lat. 50° 16′ S.; long. 84° 10′ W. Current, E. S. E., 31 miles. Barometer, 30.60. Winds: N. by W., N. W. by N., W. N. W. Light breezes from the N., and pleasant weather; middle part, moderate, with light rain; morning, foggy; latter part, light breezes and foggy weather; at meridian, fog lifted and got observations.

Feb. 18. Lat. 46° 32′ S.; long. 85° 17′ W. No current. Barometer, 30.35. Winds: W. by N.,

W. S. W., and S. W. First part, brisk breezes and cloudy; middle part, strong breezes and squally, with a heavy head sea; latter part, strong breezes, with cloudy hazy weather.

Ship Golden West (Samuel R. Curwen).

Feb. 10. Lat. 49° 41′ S.; long. 63° 01′ W. Barometer, 29.40; temperature of air, 49°. Winds: N. N. W., N. N. W. to N., S. S. E. First part, brisk breezes and pleasant; middle part, moderate and thick foggy weather. Sharp lightning at S. E. and S. W.; latter part, brisk breezes from S. S. E. and cloudy. Distance, 157 miles. Appearance of soundings.

Feb. 11. Lat. 50° 38′ S.; long. 65° 31′ W. Barometer, 29.55; temperature of air, 56°. Winds: S. S. W., W. by S., W. N. W. Commences with brisk breezes and cloudy; middle part, light airs and pleasant; latter part, gentle breezes, and passing clouds. Distance, per log, 125 miles. Water much discolored.

Feb. 12. Lat. 52° 58′ S.; long. 66° 13′ W. Barometer, 29.45; temperature of air, 54°. Winds: W. N. W., N. W. to N., S. W. by W. First part, gentle breezes, and pleasant; middle part, light baffling airs, and cloudy. Ends with brisk breezes and clear weather. Sounded in 65 fathoms; gray sand. Distance, 146 miles.

Feb. 13. Lat. 54° 48′ S.; long. 63° 44′ W. Barometer, 29.55; temperature of air, 51°. Winds: S. W. by W., S. S. W. to N. W., W. Commences with fine breezes and pleasant. During the night, light airs from S. S. W. to N. W. and cloudy, at times. At 9 P. M. sounded in 60 fathoms; white and gray sand, and gravel. At 3 hours 30 min. A. M. saw Staten Land, bearing from S. E. to S. Ends with brisk breezes from the westward, and passing clouds. Passed several large tide rips having every appearance of heavy breakers. At noon, Cape St. John, Staten Land, bore N. W. per compass, distant 2 miles. Distance run, 151 miles.

Feb 14. Lat. 56° 09′ S.; long. 66° 01′ W. Barometer, 29.20; temperature of air, 44°. Winds: W. N. W., S. W. to S., N. to W. S. W. First part, brisk breezes and cloudy; midnight, light airs and cloudy; 2 A. M. calm; 5 A. M. light northerly airs, and thick rainy weather. Ends with light airs from W. S. W., and passing clouds. Very large swell from S. W. Land in sight bearing from W. by S. to W. by N. Experienced 40 miles current, setting N. 72° E. Distance run, 143 miles.

Feb. 15. Lat. 57° 06′ S.; long. 67° 16′ W. Barometer, 29.05; temperature of air, 50°. Winds: S. W. by W., W. to S. W., N. N. W. First part, strong breezes and cloudy; middle part, moderate and baffling; squally at times; latter part, light airs and pleasant. Current, of no consequence. Distance run, 67 miles.

Feb. 16. Lat. 57° 15′ S.; long. 68° 36′ W. Barometer, 28.90; temperature of air, 45°. Winds: N. W., W., N. N. W. First part, brisk breezes, and pleasant; middle part, heavy gales, blowing violently, in squalls; latter part more moderate, large sea, 32 miles easterly current. Distance, by log, 91 miles.

Feb. 17. Lat. 57° 07′ S.; long. 70° 12′ W. Barometer, 28.80; temperature of air, 42°. Winds: N.

W. by N., W., S. W. First part, strong gales, and squally, with rain; midnight, heavy squalls. Barometer, 28.70; latter part, brisk breezes, and passing clouds. Distance, 87 miles.

Feb. 18. Lat. 57° 32′ S.; long. 72° 06′ W. Barometer, 28.95; temperature of air, 45°. Winds: W. S. W., W. by S. to W. N. W., calm. First part, brisk breezes and pleasant; middle part, light and baffling, passing clouds; latter part, calm and pleasant. Distance, per log, 107 miles.

Feb. 19. Lat. 57° 42′ S.; long. 73° 00′ W. Barometer, 29.25; temperature of air, 47°. Wind: baffling, from S. W. to N. W.; very light baffling airs, and calm; at intervals squally appearances; tacked several times. Distance, 29 miles.

Feb. 20. Lat. 57° 18′ S.; long. 74° 26′ W. Barometer, 29.70; temperature of air, 44°. Winds: calm, calm, S. S. W.; first and middle parts, calm and clear; latter part, light airs and pleasant. Distance, 42 miles.

Feb. 21. Lat. 54° 34′ S.; long. 77° 00′ W. Barometer, 29.95; temperature of air, 43°. Winds: S. S. W., S. S. W. to W. S. W., W. S. W.; first part, light winds and pleasant; middle part, strong breezes, and squally, and continues the same throughout, with thick cloudy weather. Distance, 191 miles.

Feb. 22. Lat. 51° 57′ S.; long. 77° 45′ W. Barometer, 30.10; temperature of air, 49°. Winds: W. S. W., W. S. W. to W., W. to N. W. by N.; first and middle parts, strong breezes, squally and cloudy; latter part, light and baffling, passing clouds. Distance, 174 miles.

Feb. 23. Lat. 51° 29′ S.; long. 81° 02′ W. Barometer, 29.65; temperature of air, 47°. Winds: W. N. W., N. W. to N. N. W., N. by W. Commences moderate and pleasant; middle part, strong gales and cloudy; large swell from S. W.; latter part, strong gales, and thick foggy weather. Distance run, 142 miles.

Feb. 24. Lat. 50° 28′ S.; long. 80° 53′ W. Barometer, 29.80; temperature of air, 48°. Winds: N. N. W., W. N. W., N. W.; first part, strong gales and squally with rain; middle and latter parts, strong gales, passing clouds, and rough sea. Distance, 112 miles.

Feb. 25. Lat. 48° 39′ S.; long. 78° 09. W. Barometer, 29.95; temperature of air, 50°. Winds: N. W. by N., to N. by W., N. by W., N. W. by N.; brisk breezes and puffy; cloudy at times; weather looking squally; heavy swell from south. Distance, 190 miles.

Ship Bald Eagle (P. Dumaresq), New York to San Francisco.

Feb. 13, 1853. Lat. 49° 26′ S.; long. 64° 20′ W. Barometer, 29.72; temperature of air, 56°; of water, 52°. Winds: S. W., N. N. E., N. N. W.; moderate and pleasant.

Feb. 14. Lat. 52° 14′ S.; long. 65° 40′ W. Barometer, 29.33; temperature of air, 54°; of water, 50°. Winds: W., N. N. W., W. S. W.; light breezes, and pleasant; barometer falling.

Feb. 15. Lat. 54° 50′ S.; long. 64° 51′ W. Barometer, 29.00; temperature of air, 56°; of water, 50°. Winds: N. W., W. N. W., N. E.; light breezes, and pleasant; barometer indicating a heavy gale; in the Straits of Le Maire.

Feb. 16. Lat. 56° 8′ S.; long. 67° 20′ W. Barometer, 28.90; temperature of air, 48°; of water, 46°.

Winds: N. E., S. W., N.; strong breezes; night squally, with rain; vivid lightning. Ends fresh gales; passed Cape Horn.

Feb. 17. Lat. 56° 36′ S.; long. 70° 41′ W. Barometer, 28.82; temperature of air, 44°; of water, 43°. Winds: N., W., S. W. by S.; fresh gales; passed inside of Diego Ramirez; light and squally.

Feb. 18. Lat. 57° 1′ S.; long. 72° 30′ W. Barometer, 28.94; temperature of air, 42°; of water, 44°. Winds: S. W., W. by N., W.; fresh breezes; middle part, light and squally. Ends with light airs.

Feb. 19. Lat. 57° 14′ S.; long. 73° 34′ W. Barometer, 29.17; temperature of air, 43°; of water, 43°. Winds: westerly, westerly, W. N. W.; light airs throughout.

Feb. 20. Lat. 56° 46′ S.; long. 75° 18′ W. Barometer, 29.66; temperature of air, 42°; of water, 45°. Winds: N. W., E., S. S. E.; light airs throughout.

Feb. 21. Lat. 53° 50′ S.; long. 79° W. Barometer, 29.60; temperature of air, 44°; of water, 44°. Winds: S. by W., S. W., W. S. W.; light breezes; middle and latter parts, fresh and cloudy.

Feb. 22. Lat. 51° 29′ S.; long. 80° 46′ W. Barometer, 29.92; temperature of air, 47°; of water, 47°. Winds: W. S. W., W. by N., N. N. W.; fresh gales; middle part, moderate. Ends fresh and pleasant.

Feb. 23. Lat. 50° 6′ S.; long. 84° 43′ W. Barometer, 28.36; temperature of air, 46°; of water, 47°. Winds: N. by W., N. W., N. by W.; fresh breezes; middle part, rainy. Ends strong gales.

Ship Phantom (A. J. Hallett), Boston to San Francisco.

Feb. 25, 1853. Lat. 49° 03′ S.; long. 65° 07′ W. Variation observed, 22° E. Barometer, 29.09; temperature of air, 58°; of water, 50°. Winds: N. N. W., S., S. Moderate breezes and clear weather. At 4 P. M. made Cape Blanco, bearing S. W., distant 15 miles; tacking during the night and forenoon.

Feb. 26. Lat. 53° 14′ S.; long. 65° 59′ W. Ripples. Variation observed, 22° E. Barometer, 29.8; temperature of air, 65°. Winds: S. S. E., N. E., N. N. W. First part, moderate and fine weather, with a smooth sea; midnight, fresh breezes and cloudy, with a thick scud flying from the N. E.; latter part, fresh breezes, and a heavy sea running; no observation. Distance run, 264 miles.

Feb. 27. Lat. 55° 05′ S.; long. 62° 30′ W. Heavy ripples. Variation observed, 22° E. Barometer, 29.7; temperature of air, 59°; of water, 52°. Winds: N. N. W., N. W., S. W. First and middle parts, fresh breezes with rain, and thick weather; latter, moderate and fine; hard luck.

Feb. 28. Lat. 56° 55′ S.; long. 64° 05′ W. Variation observed, 17° E. Barometer, 29.7; temperature of air, 54°; of water, 50°. Winds: W. S. W., W. S. W., N. W. Moderate breezes throughout the day; latter, thick and drizzly, with rain.

March 1. Lat. 56° 45′ S.; long. 67° 02′ W. Ripples. Variation observed, 19° E. Barometer, 29.5; temperature of air, 54°; of water, 50°. Winds: W. by N., W. N. W., S. W. First and middle parts, squally, with rain; latter, heavy gales from the S. W., and a heavy sea running; ship laboring hard; water making a clear breach over her; close-reefed topsail.

March 2. Lat. 57° 07′ S.; long. 67° 32′ W. Variation observed, 19° E. Barometer, 29.7; tempera-

ture of air, 60°; of water, 53°. Winds: S. W., W. S. W., W. S. W. Heavy gales throughout the day. At 4 P. M., Cape Horn bore by compass N. by W. ½ W., distant 25 miles; wore ship.

March 3. Lat. 58° 23′ S.; long. 69° 45′ W. Variation observed, 20° E. Barometer, 29.2; temperature of air, 64°; of water, 54°. Winds: W. by N., W., S. W. by W. Comes in with fresh breezes and squally, with rain; middle, still raining; the weather looking bad, double reefed the topsails. At 4 A. M., heavy gales; put the ship under storm canvas; heavy sea.

March 4. Lat. 58° 42′ S.; long. 72° 35′ W. Variation observed, 22° E. Barometer, 29.2; temperature of air, 56°; of water, 50°. Winds: S. W., N. W., N. W. Fresh breezes and squally throughout the day; heavy sea running.

March 5. Lat. 59° 21′ S.; long. 73° 10′ W. Variation observed, 22° E. Barometer, 28.8; temperature of air, 56°; of water, 44°. Wind: N. W. throughout. Fresh gales and squally during 24 hours; very heavy sea running; ship laboring hard.

March 6. Lat. 59° 36′ S.; long. 75° 50′ W. Variation observed, 22° E. Barometer, 28.9; temperature of air, 54°; of water, 45°. Winds: N. W., N. W., S. W. Fresh gales, with a heavy sea running. At 6 A. M., took the wind from S. W.; wore ship.

March 7. Lat. 58° 57′ S.; long. 77° 36′ W. Variation observed, 22° E. Barometer, 29.2; temperature of air, 55°; of water, 46°. Winds: S. W., W., N. W. First part, moderate breezes and cloudy; middle, light airs and thick hazy weather; latter, calm, and thick hazy weather.

March 8. Lat. 57° 48′ S.; long. 80° 80′ W. Variation observed, 22° E. Barometer, 28.8; temperature of air, 60°; of water, 49°. Winds: N. W., N. N. E., S. W. Comes in with light breezes and thick hazy weather. At 7 P. M., tacked ship; at 11 P. M., fresh gales; a heavy sea from W. N. W., making a clear breach over the ship, and filling her with water; latter part, fresh gales and heavy squalls at times; passed near an American ship bound to California.

March 9. Lat. 55′ 08′ S.; long. 80° 25′ W. Variation observed, 22° E. Barometer, 29.3; temperature of air, 58°; of water, 48°. Winds: W. S. W., W., W. Moderate breezes and squally, with a heavy sea running; middle and latter part, moderate breezes; no observations; this is a hard wind to get along with.

March 10. Lat. 53° 16′ S.; long. 79° 08′ W. Variation observed, 22° E. Barometer, 29.5; temperature of air, 60°; of water, 49°. Winds: W., calm, E. S. E. First part, light airs and thick weather; middle, calm, and thick weather, with heavy clouds hanging around; latter, moderate breezes and fine weather.

March 11. Lat. 50° 46′ S.; long. 81° 47′ W. Variation observed, 23° E. Barometer, 29.5; temperature of air, 58°; of water, 50°. Winds: S. E., calm, N. N. E. First part, moderate; middle, calm; latter part, fresh gales. The sea making a clear breach over the ship fore and aft; heavy squalls, with rain.

March 12. Lat. 51° 17′ S.; long. 83° 45′ W. Variation observed, 22 E. Barometer, 29.3; temperature of air, 60°; of water, 52°. Winds: N. N. E., N. W., N. W. Fresh gales and heavy sea running. Pitched

away flying jib-boom, and drew away a good many bolts from the bows. Laboring very hard, and men much used up by the sea breaking over the ship.

March 13. Lat. 50° 43′ S.; long. 84° 10′ W. Variation observed, 22° E. Barometer, 29.6; temperature of air, 60°; of water, 48°. Winds: N. W., W. S. W., W. by N. First part, fresh gales; lying to. At 5 P. M. wore ship and made sail. Middle part, squally, and bad sea running. At 8 A. M. tacked to the S. W., and at noon to north; latter part, fresh breezes and thick, hazy, rainy weather. No observation to-day. Saw a ship to leeward, standing to the northward and eastward.

March 14. Lat. 47° 35′ S.; long. 83° 10′ W. Variation observed, 22° E. Barometer, 29.7; temperature of air, 62°; of water, 49°. Winds: W. N. W., S. W., and S. by W. First part, moderate and thick, hazy weather; middle part, squally, with heavy rain. At midnight, wind shifted suddenly from N. W. to S. W., and blowing fresh; continued so up to noon with a clear sky; ship going 15 knots per hour from 1 A. M. to noon. At 5 P. M. spoke and passed clipper ship Toronto, bound same way, sixty-nine days out. Latter part, fresh breezes and fine weather, with passing clouds. Got a good observation to-day.

March 15. Lat. 44° 27′ S.; long. 85° 24′ W. Variation observed, 22° E. Barometer, 30.00; temperature of air, 61°; of water, 48°. Winds: S. S. W., S. S. W., S. W. First and middle parts, fine breezes and fine weather; latter part, light airs and cloudy; smooth sea. Rate, from 14 to 3 knots per hour.

March 16. Lat. 43° 37′ S.; long. 88° 29′ W. Variation observed, 22° E. Barometer, 30.20; temperature of air, 63°; of water, 49°. Winds: W. S. W., N. N. W., S. E. Comes in with light breezes and cloudy. Middle, squally, with rain. At 6 A. M. took a squall of wind from the south, which soon cleared the weather. Latter part, gentle breezes and fine weather. Ship going 14 knots with light sails. Now shall make a straight course for 115° longitude, in parallel of 37° south, as per your valuable Sailing Directions, which I think much of.

Capt. John S. Farron to Lieut. Maury.

I have the pleasure of forwarding you the abstract log of the clipper ship Eagle, under my command, from New York to this port, where I arrived on the 30th ult. You will perceive by it that, from the latter part of the 18th to the 23d January, I had the wind from S. by W., and south, which obliged me to go farther to the eastward than you recommended, and that I crossed the equator also a little to the eastward of your route for that month—on the 24th day. On the 1st February, at noon, during a squall from N. N. E., a whirlwind, veering on its axis from right to left, and moving with an unequal and unsteady motion from E. N. E. to W. S. W., passed within twenty yards of the ship's stern, the ship going 6 knots; when right astern, we were taken aback by the eddy for about two minutes, or until it had passed on our quarter; it moved at the rate of about five miles per hour, and raised the water as if boiling, and seemed to increase as it progressed; but the rain that succeeded shortly after, obscured it from our view. I did not take the S. E. trades until in the latitude of 3° 30′ S., and had a fair run of 40 days to the river Plata, and, passing through the Straits of Le Maire, I made Cape Horn on the fifty-fourth day. I had to go as far south as 59° 20′ S.; and had bad weather until I reached the parallel of 30°, and found no trade until

in 22°, and then on the average at E. N. E., which made me regret striving so much to get to the westward. However, I crossed the equator on the ninety-first day, in 115° 30′. I would call your attention to the great fall in the temperature of both air and water, immediately on passing the line; which, taken in connection with the variableness of the wind for some days, the overcast appearance of the weather, and heavy swell coming from the W. N. W., inclines me to think that it has been blowing heavily from the N. W. at some distance in that direction from us, so as to change the direction and interrupt the regular trade, which I think we ought to have carried farther than the parallel of 19° N.

You will observe, also, with respect to the currents in the Pacific, that I found none observable after the 15th March, the observations and the dead reckoning agreeing very nearly, excepting on the 18th, when there was a rise in the temperature of 7°, and a great difference in the latitudes by observation and D. R., which would intimate a current nearly south; but after that there was no indication of any.

I am bound home from this port, *via* Rio de Janeiro, but I have not yet made up my mind what track I shall pursue, and have no data to guide me; however, I incline to the opinion of not going too far to the eastward. Trusting I shall be able to give you a good report, I remain, dear sir, yours, &c.

Eagle (Jno. S. Farron).

Feb. 26. Lat. 49° 36′ S.; long. 58° 54′ W. Barometer, 30.10; temperature of air, 46°; of water, 46°. Winds: N. to E., E., N. to E. Throughout, winds very variable with cloudy weather.

Feb. 27. Lat. 50° 19′ S.; long. 64° 47′ W. Current, ½ knot per hour. Barometer, 29.90; temperature of air, 51°; of water 48°. Winds: strong N., N. W., S. S. W. First part, hazy; middle, flawy, cloudy, and hazy; latter, clear. At 7 A. M. 8 fathoms, dark gray sand.

Feb. 28. Lat. 51° 20′ S.; long. 65° 56′ W. Barometer, 29.81; temperature of air, 52°; of water, 48°. Winds: S. S. W., N. W., N. First part, clear; from 8 to 12, calm; middle part, clear; latter, cloudy. At 8 A. M. 65 fathoms, with the same bottom.

March 1. Lat. 54° 21′ S.; long. 65° 45′ W. Barometer, 29.48; temperature of air, 50°; of water, 46°. Winds: N. N. W., N. W., W. S. W. First and middle parts, hazy; latter, threatening appearances. At 7 A. M. saw the coast of Terra del Fuego.

March 2. Lat. 55° 25′ S.; long. 65° 30′ W. Barometer, 29.55; temperature of air, 50°; of water, 46°. Winds: S., W. S. W., N. W. First part, cloudy; middle, cloudy with calms; latter, cloudy and hazy, with strong tide rips throughout. At 7 hours 30 min. P. M. Cape Diego bore S. by E. 5 leagues distant. At noon, east end of Staten Land bore N. E. by N.; Cape Good Success, N. by W.

March 3. Lat. 57° 01′ S.; long. 67° 00′ W. Current, E. N. E., 1 knot per hour. Barometer, 29.27; temperature of air, 51°; of water, 44°. Winds: N., W. N. W., W. S. W. First part, clear; middle, squally with drizzling rain; latter, heavy gales with hard squalls of rain. At 7 P. M. Cape Horn bore S. W. ½ S.

March 4. Lat. 57° 39′ S.; long. 68° 18′ W. Current, E. N. E., 1 knot per hour. Barometer, 29.10; temperature of air, 48°; of water, 42°. Winds: decreasing, W. S. W., W. N. W., N. N. W. First part, passing clouds; middle, clear; latter, cloudy and foggy with drizzling rain.

March 5. Lat. 58° 47′ S.; long. 71° 40′ W. Barometer, 29.00; temperature of air, 46°; of water, 42°. Winds: W. S. W., W. N. W., W. N. W. First part, fresh winds, cloudy, and hazy; middle, fresh squalls and rainy; latter, gales; cloudy, and squally.

March 6. Lat. 59° 20′ S.; long. 74° 20′ W. Barometer, 28.85; temperature of air, 42°; of water, 41°. Winds: W. N. W., W. N. W., N. W. by W. First part, fresh gales and squally; middle and latter, moderate, hazy, and foggy, with drizzling rain throughout. At 9 A. M. the wind shifted to S. W. and cleared off.

March 7. Lat. 58° 05′ S.; long. 75° 51′ W. Barometer, 29.00; temperature of air, 42°; of water, 42°. Winds: S. W. by W., W. N. W., and W. S. W. to N. N. E. Moderate and cloudy, with drizzling rain throughout.

March 8. Lat. 57° 14′ S.; long. 77° 17′ W. Current, E., 1 knot per hour. Barometer, at 4 A. M., 28.08; at noon, 28.66; temperature of air, 40°; of water, 42°. Winds: W., N. W., S. W. by S. First part, light winds and cloudy; at 8 A. M. wind hauled to north, squally with rain; middle, heavy gales, with heavy squalls, sleet, and rain; latter part, heavy gales, hard squalls, and cloudy. A heavy sea running.

March 9. Lat. 55° 27′ S.; long. 78° 12′ W. Current, 1 knot per hour, E. Barometer, 29.25; temperature of air, 42°; of water, 44°. Winds: S. W. by W., W. S. W., and S. W. First part, strong gales, with hard squalls and hail; middle, fresh gales, cloudy, and squally with hail; latter, moderate, with passing clouds.

March 10. Lat. 54° 30′ S.; long. 79° 10′ W. Current, E., twenty knots during the day. Barometer, 29.43; temperature of air, 42°; of water, 44°. Winds: S. W. by W., S. W. by S., and S. S. E. to S. W. First part, moderate; middle and latter, light; calm, from 10 P. M. to 8 A. M.; a heavy swell from W. N. W.

March 11. Lat. 53° 12′ S.; long. 83° 24′ W. Current, half a knot per hour, E. Barometer, 29.50; temperature of air, 45°; of water, 45°. Winds: S. S. W., variable, N. N. E. First part, fresh winds and passing clouds; middle, light variable airs and calms; latter part, gales, with thick cloudy weather; a heavy sea from N. W.

March 12. Lat. 53° 17′ S.; long. 85° 30′ W. No perceptible current. Barometer, 28.90; temperature of air, 46°; of water, 44°. Winds: N. N. E., N. W. by N., N. W. by W. Begins hazy, with threatening weather; middle and latter parts, heavy gales, with hard hail squalls; cloudy, misty weather.

March 13. Lat. 51° 48′ S.; long. 85° 39′ W. No perceptible current. Barometer, 29.56; temperature of air, 45°; of water, 45°. Winds: W., S. W. by W., W. First part, strong gales and heavy squalls, with thick weather; middle, wind decreasing; overcast with drizzling rain; latter part, moderate, with drizzling rain; a very heavy N. W. sea.

March 14. Lat. 49° 02′ S.; long. 87° 19′ W. No perceptible current. Barometer, 30.06; temperature of air, 47°; of water, 49°. Winds: S. W., S. S. W., S. W. by S. First part, light airs, calm, cloudy and rainy; middle, fresh gales and cloudy; latter, strong breezes and fair; a heavy westerly sea on throughout.

Tornado (O. R. Mumford), New York to San Francisco.

Feb. 28, 1853. Lat. 47° 52′ S.; long. 64° 44′ W. Barometer, 29.95; temperature of air, 57°; of water, 52°. Winds: S. S. E., E., and N. E. Sounded with patent lead, in 57½ fathoms, gray sand; light breezes and calms. At 4 A. M. sounded in 56 fathoms, gray sand; lat. 47° 16′ S.; long. 64° 30′ W. Distance sailed by observation, 3,897 miles this month.

March 1. Lat. 51° 31′ S.; long. 65° 06′ W. Barometer, 29.50; temperature of air, 52°; of water, 49°. Winds: N., N. N. E., and N. Fine breezes and hazy weather; distance run, 220 miles.

March 2. Lat. 54° 19′ S.; long. 65° 05′ W. Barometer, 29.55; temperature of air, 50°; of water, 47°. Winds: S. W., S. W., and W. S. W. Moderate breezes and hazy weather; the land about Cape St. Diego could be seen through the haze; spoke the barque Golden Age from Monte Video, bound to San Francisco; distance run, 168 miles.

March 3. Lat. 56° 00′ S.; long. 65° 10′ W. Barometer, 28.90; temperature of air, 50°; of water, 45°. Winds: W. S. W., W. N. W., and N. W. by W. Found it useless to attempt the straits with this wind, the ebb tide just having made; at 7 P. M. Cape St. John's W. ¾ N., distant 6 miles, I noticed a natural bridge, from the first high peak west of the cape to the land to the south of it. When Cape St. John's bears S. 7° W., the peak will bear S. 20° W. when 6 miles from the land. Distance run, 146 miles.

March 4. Lat. 56° 34′ S.; long. 67° 40′ W. Current, E., 1 mile per hour. Barometer, 28.81; temperature of air, 50°; of water, 46°. Winds: S. W., S. W. and calm, and N. W. by N. Moderate breezes and pleasant; at noon, Cape Horn, N. 4° W. by compass, distant, 38 miles, and clearly seen. The islands west of it plain in sight, distant 90 miles; strong current rips.

March 5. Lat. 58° 00′ S.; long. 70° 24′ W. Current, E., ¾ mile per hour. Barometer, 28.62; temperature of air, 49°; of water, 44°. Winds: N. W., W. by S., and W. by N. ½ N. At 1 hour 30 min. P. M. the Islands of Diego Ramirez bearing W. S. W., distant 30 miles; at 2 hours 15 min. P. M. Diego Ramirez bore W. ½ N. true, and Cape Horn N. E. by N., just seen on the horizon. Latter part, a heavy head sea, and squally; took in two reefs. Distance run, 124 miles.

March 6. Lat. 58° 40′ S.; long. 73° 27′ W. Current, E., ¾ mile per hour. Barometer, 28.56; temperature of air, 48°; of water, 43°. Winds: W. by N., W. by N. ½ N., and N. W. Moderate gale, and a very heavy head sea, with frequent squalls. At 11 hours 30 min. A. M. wind suddenly shifted to the S. W. Distance run, 104 miles.

March 7. Lat. 58° 02′ S.; long. 74° 58′ W. Current, E., ½ mile per hour. Barometer, 28.60; temperature of air, 46°; of water, 44°. Winds: S. W., W. by S., and N. W. by N. Light breezes from the S. W., and foggy, with rain. At 4 A. M. tacked to the southward; at noon, struck aback with a wind from the S. W. Distance run, 62 miles.

March 8. Lat. 57° 17′ S.; long. 76° 22′ W. Current, E., 1¼ miles per hour. Barometer, 27.60; temperature of air, 46°; of water, 45°. Winds: W. by S., N. W. by W., and S. W. At 2 P. M. a clipper ship on our lee quarter, dist. 8 miles. At 10 P. M. wind backing to the N. Barometer, falling fast; latter

part, hard rain, wind increasing and hauling to the westward, in heavy squalls. Distance run, 64 miles; clipper ship bears S. S. W. 14 miles.

March 9. Lat. 55° 19′ S.; long. 77° 25′ W. Current, 31 miles, S. 71° E. Barometer, 28.72; temperature of air, 43°; of water, 44°. Winds: S. W. by W., W. S. W., and S. W. Strong breezes and a heavy irregular sea; squalls heavy for two reefs. Distance run, 124 miles; clipper ship S. by W. distant 14 miles.

March 10. Lat. 54° 22′ S.; long. 78° 52′ W. Barometer, 28.90; temperature of air, 46°; of water, 45°. Winds: S. W., calm, and south. Light breezes and fine weather; clipper ship S. W. by S. distant 13 miles.

March 11. Lat. 52° 55′ S.; long. 83° 00′ W. Barometer, 29.00; temperature of air, 44°; of water, 45°. Winds: S., S. and E., and N. N. E. Moderate breezes and pleasant weather. Latter part, fresh breezes. Distance run, 173 miles.

March 12. Lat. 52° 32′ S.; long. 84° 38′ W. Current, E., 18 miles. Barometer, 28.40; temperature of air, 50°; of water, 46°. Winds: N., N. W. by N., N. W. by N. ½ N. Heavy gales; ship under close reef; heavy rain; at 6 P. M. wore ship; a strong gale blowing, and an ugly sea. Distance run, 82 miles.

March 13. Lat. 50° 25′ S.; long. 84° 00′ W. Current, E., 18 miles. Barometer, 29.00; temperature of air, 48°; of water, 47°. Winds: W. S. W., N. W. by N., and N. W. Strong gales, and squally until 7 A. M.; shook out all reefs; clipper ship five miles to windward, on the western tack. Latter part, foggy. Spoke the ship Phantom, from Boston, sailed January 6. Ends with light rain. Distance run, 170 miles.

Capt. O. R. Mumford to Lieut. Maury.

You will please note that I was compelled, by baffling winds, to make several tacks each day, between the parallels of 35° and 30° S., long. 95° to 100° W. Had I been a few degrees farther east, I have no doubt but that I should have made a better passage; and I have reason to think that if I could have got farther west, such would have been the case; for it appears we were between two winds, not far distant from us either way. We crossed the equator in 118° W., and were 22 days into port, having light winds after passing 28° N. I was very particular about the current, from 30° N. and 135° W. into port; and my observations confirmed those of my other passages. If I ever should come this way again, I will never cross the equator east of 118° W., which I think is about the right spot.

Masconoma (A. D. Cobb), Boston to San Francisco.

March 19, 1853. Lat. 51° 03′ S.; long. 65° 39′ W. Barometer, 30.03; temperature of air, 50°; of water, 48°. Winds: W. N. W., N. W., S. W. First part, light wind and fine weather; middle, moderate and hazy; latter, fresh breezes and fine weather.

March 20. Lat. 53° 37′ S.; long. 65° 18′ W. Current, 1 knot, N. E. Barometer, 29.94; temperature of air, 47°; of water, 45°. Winds: W. S. W. throughout; fine breezes, and pleasant. Barometer, falling.

March 21. Lat. 55° 04′ S.; long. 65° 13′ W. Current, the same. Barometer, 29.57; temperature of air, 48°; of water, 44°. Winds: N. N. W., N. N. W., N. W. First part, light winds, and clear; at 6 P. M. hauled up to go outside of Staten Land; midnight, strong winds, and foggy; morning, more moderate; at 8 A. M. hauled up to westward to double Cape St. John. Ends foggy.

March 22. Lat. 55° 25′ S.; long. 64° 20′ W. Barometer, 29.53; temperature of air, 46°; of water, 43°. Winds: N. N. W., S. W., S. E. First part, light airs, and foggy; middle part, very thick, with variable winds, and light rain; latter part, variable airs, and clear. At noon, Cape St. John bore (per comp.) N. N. E. 45 miles distant.

March 23. Lat. 56° 07′ S.; long. 66° 20′ W. Current, 1 knot, N. E. Barometer, 29.50; temperature of air, 47°; of water, 46°. Winds: W., N. W., N. W. by W. First part, light and fine; midnight, strong winds. Ends with light airs from the N. W., with a heavy S. W. swell. Barometer falling slowly.

March 24. Lat. 56° 39′ S.; long. 66° 49′. Barometer, 29.25; temperature of air, 47°; of water, 45°. Winds: N. N. W., W., W. Commences light winds, and cloudy; midnight, squally and rainy. Ends with strong gales. Barometer, steady.

March 25. Lat. 57° 32′ S.; long. 67° 21′ W. Current, 1 knot, N. E. Barometer, 28.20; temperature of air, 41°; of water, 44°. Winds: W. by N., N. W., W. First part, strong gales, with heavy rain; moderated during the afternoon; midnight, the wind increased to a hard gale, which continued throughout. At noon, barometer 28.84.

March 26. Lat. 58° 03′ S.; long. 67° 26′ W. Barometer, 28.84; temperature of air, 41°; of water, 42°. Wind: west; hard gales with snow squalls.

March 27. Lat. 57° 45′ S.; long. 68° 17′ W. Current, 1 knot, E. N. E. Barometer, 28.90; temperature of air, 40°; of water, 42°. Winds: W., S. S. W., E. First part, hard gales, with severe hail squalls; middle, light, variable winds; at 10 A. M. wind canted to S. S. W., in a snow squall, and increased to a hard gale.

March 28. Lat. 57° 10′ S.; long. 68° 20′ W. Current, the same. Barometer, 28.80; temperature of air, 37°; of water, 45°. Winds: S. W., W., S. by W. First part, strong gales, with heavy squalls, hail, and snow; middle, the same. Ends with moderate winds, and snow squalls.

March 29. Lat. 56° 35′ S.; long. 69° 47′ W. Barometer, 29.60; temperature of air, 36°; of water, 46°. Winds: S. by W., S. by W., S. Commences with strong gales and heavy squalls, and much snow; at 10 A. M. more moderate. Ends with fresh gales and light squalls.

March 30. Lat. 56° 30′ S.; long. 71° 21′ W. Current, 2 knots, E. N. E. Barometer, 29.10; temperature of air, 36°; of water, 43°. Winds: S., S. by E., S. Commences fresh gales and fine weather; middle, light, variable winds, with light snow squalls. Ends fine; with good observations find a 2 knot current (easterly), for the last three days.

March 31. Lat. 56° 07′ S.; long. 73° 26′ W. Current, 1 knot, E. N. E. Barometer, 29.00; temperature of air, 36°; of water, 43°. Winds: S. S. E., S. by E., S. S. E. First part, strong winds, with light snow squalls; middle, light and variable, with heavy clouds; latter, moderate and fine.

April 1. Lat. 55° 36′ S.; long. 78° 18′ W. Barometer, 29.45; temperature of air, 38°; of water, 43°. Winds: S. E., S., S. S. E. First part, moderate; middle and latter parts, strong gales, with snow squalls.

April 2. No observation. Barometer, 29.64; temperature of air, 43°; of water, 45°. Winds: S. S. W., S. S. W., S. W. Commences with strong winds, rain, and snow; middle, strong winds and cloudy; latter, strong gales, with snow and rain.

April 3. No observation. Barometer, 29.64; temperature of air, 45°; of water, 46°. Winds: S. W., S. S. W., S. Commences with strong gales and thick weather, which continue throughout the day.

April 4. No observation. Barometer, 29.85; temperature of air, 47°; of water, 50°. Winds: S. S. W., S. W. by S., S. W. Commences with strong winds, and rainy appearances; midnight, strong gales, and thick cloudy weather. Ends with fresh breezes, and cloudy. Lat. (D. R.) supposed to be about 50° S.

A. Cheseborough (R. C. Cheseborough), New York to San Francisco.

March 19, 1853. Lat. 50° 57′ S.; long. 65° 46′ W. Barometer, 30.00; temperature of air, 56°; of water, 52°. Winds: N. W., S. W. First part, wind light and pleasant; middle and latter parts, moderate breezes and pleasant. Barometer varying from 29.55 to 30.20, without any change.

March 20. Lat. 53° 24′ S.; long. 65° 17′ W. Barometer, 29.90; temperature of air, 58°; of water, 54°. Winds: S. W., W., N. First and middle parts, moderate and pleasant; latter part, light.

March 21. No observation. Barometer, 29.70; temperature of air, 58°; of water, 48°. Wind north. First and middle parts, pleasant; latter, foggy; wind variable.

March 22. No observation. Barometer, 29.50; temperature of air, 56°; of water, 49°. Winds: variable throughout. Begins with light winds and a thick fog. At noon, sounded in 40 fathoms; wore ship to the westward; at 3 P. M., saw N. W. point of Staten Land bearing E., distant three miles; wore ship to the southward; strong tide setting E. N. E.; tacked ship to N. E.; 8 P. M., fell calm; 9 P. M., light southerly breeze; saw the land, bearing east, eight miles distant; midnight, rain; 2 A. M., calm; 6 A. M., St. Diego bearing W., 10 miles distant; Cape St. Bartholomew, S. by E., 14 miles; being in 45 fathoms water, and finding a strong tide setting to the eastward, concluded not to go through the Straits of Le Maire; ends with light winds; at 11 hours 30 min. Cape St. John, E. S. E., 15 miles distant.

March 23. No observation. Barometer, 29.50; temperature of air, 53°; of water, 48°. Winds: W., N. N. E., N. First part, light wind, with fine weather. At 6 P. M., calm; 8 P. M., light N. N. E. breeze; at 10, moderate; strong current W. S. W., and finding we could not clear Cape St. John, tacked to the westward, and stood again for the Straits of Le Maire; at 7 hours 30 min. entered with a strong favorable tide and light north wind; at 9 A. M., passed Cape Good Success; ends clear.

March 24. Lat. 56° 29′ S.; long. 66° 40′ W. (D. R.) Barometer, 29.30; temperature of air, 49°; of water, 48°. Winds: N. N. E., calm, W. Begins with light winds and fine weather; middle part, calm; at 2 A. M., strong gales from the westward, with rain and hard squalls; ends moderate, with the sun out at times.

March 25. Lat. (D. R.) 57° 10′ S.; long. (D. R.) 68° 50′ W. Barometer, 29.00; temperature of air, 44°; of water, 48°. Winds: W., N., N. W. Begins moderate; at 3 P. M., Cape Horn in sight, bearing N. W., 40 miles distant; 8 P. M., wind light from the northward; midnight, strong gales; 4 A. M., squally, with hail; ends strong gales and heavy sea.

March 26. Lat. 58° 15′ S.; long. ——. Barometer, 28.85; temperature of air, 40°; of water, 44°. Winds: W., W., W. S. W. Commences with hard gales and heavy squalls; at 1 P. M., barometer, 28.85; wind increasing; at 2, barometer, 29.10; squalls not so heavy; middle and latter parts, strong gales and hard squalls of hail and rain.

March 27. Lat. 57° 40′ S.; long. 70° 10′ W. Barometer, 28.80; temperature of air, 40°; of water, 44°. Winds: W. S. W., calm, S. W. First part, moderate; middle, calm; at 2 A. M., light from S. E.; 4 A. M., south; 8 A. M., S. W.; strong gales and squalls; ends same; barometer, 29.10.

March 28. Lat. 56° 30′ S.; long. 71° 30′ W. Barometer, 28.90; temperature of air, 36°; of water, 42°. Winds: W., calm, S. W. First part, strong gales; at 9 P. M., calm; 11 P. M., E.; 1 A. M., S. E.; Barometer, 28.70; 8 A. M., hard gales, and squalls, and high sea; ends the same; barometer, 29.15.

March 29. Lat. 55° 40′ S.; long. 73° 10′ W. Barometer, 29.10; temperature of air, 38°; of water, 42°. Winds: S. W., S. W., S. E. First part, hard squalls and calms; middle part, light; at 8 A. M., light from the eastward; barometer, 29.20.

March 30. Lat. 53° 57′ S.; long. 75° 30′ W. Barometer, 29.20; temperature of air, 40°; of water, 43°. Winds: S. E., S. S. W., S. S. W. First part, light from the southward, with light snow squalls; at 3 P. M., pleasant; middle and latter parts, moderate, with light snow squalls; at 11 hours 30 min. A. M., passed through strong tide rips.

March 31. Lat. 52° 48′ S.; long. 77° 37′ W. Barometer, 29; temperature of air, 42°; of water, 46°. Wind: variable throughout. Frequent squalls of snow, and sometimes calm.

April 1. Lat. 49° 41′ S.; long. 78° 30′ W. Barometer, 29.20; temperature of air, 45°; of water, 47°. Winds: variable, S., S. First part, variable, with light squalls of rain and snow. At 6 P. M. strong gales and hard squalls from the southward; middle and latter parts the same; at noon barometer, 29.70.

Lucknow (S. Plumer), Boston to California.

March 7, 1853. Lat. 47° 51′ S.; long. 63° W. Current, slight, N. Barometer, 29.68; temperature of air, 54°; of water, 53°. Winds: N. W., S. S. W., W. S. W. Begins with a fine N. W. wind and pleasant weather; at evening, it hauled to the westward. During the night, wind baffling from W. to S. At 8 A. M. sounded in 65 fathoms; black and yellow fine sand. Latter part, fine breezes and pleasant. Barometer rather low for such weather, 29.60 to 29.70. Much kelp and sea-weed. 2 A. M. tacked to W., and at 8 A. M. to S.

March 8. Lat. 50° 26′ S.; long. 65° 33′ W. Barometer, 28.88; temperature of air, 58°; of water, 53°. Winds: W. S. W., N. W., W. Begins with light breezes and fine weather; evening, wind hauling

to N. W., and increasing; middle, fresh gales; barometer falling, 29.40; latter part, hard gales and cloudy; barometer at a stand, 28.88; wind hauling to S. W.

March 9. Lat. 51° 22′ S.; long. 64° 36′ W. Slight northerly current. Barometer, 29.25; temperature of air, 52°; of water, 48°. Winds: W. S. W., S. W., S. S. W. First part, hard gales and furious squalls; middle and latter parts, hard gales. Barometer rising very slowly.

March 10. Lat. 51° 51′ S.; long. 64° 56′ W. Current (per hour), 1 knot, N. N. W. Barometer, 29.30; temperature of air, 50°; of water, 48°. Winds: S. W. by S., S. W. by W., S. W. Unsteady winds and dark cloudy weather, with showers of rain. At 1 P. M. wore ship to the westward, and at 8, to the southward.

March 11. Lat. 51° 53′ S.; long. 65° 26′ W. Current (per hour), $\frac{3}{4}$ knot, N. Barometer, 29.55; temperature of air, 49°; of water, 48°. Winds: S. W., S. S. E. to S., S. S. W. Begins with unsteady, gloomy, rainy, and squally weather. Barometer falling. 11 P. M. wind hauled S. S. E. suddenly in a squall; wore to the westward; barometer rose $\frac{3}{10}$ with this change of wind. Ends with hard gale, rough sea, and clear sky.

March 12. Lat. 52° 34′ S.; long. 66° 28′ W. Current (per hour), $\frac{3}{4}$ knot, N. N. W. Barometer, 29.60; temperature of air, 53°; of water, 49°. Winds: S. S. W. to S. E., S. E. to N. E., N. E. to N. N. W. Moderating; sea going down; during the night, a light air hauling to the northward. Ends with a moderate N. N. W. wind and cloudy weather. Barometer from 29.90 to 29.60.

March 13. Lat. 54° 50′ S.; long. 65° W. Barometer, 29.18; temperature of air, 51°; of water, 49°. Winds: N. N. W., N. W., N. W. to W. Begins with light breezes and cloudy. Sounded in from 47 to 54 fathoms. At daylight saw the land. At 10 hours 15 min. entered the Straits of Le Maire with a fine N. W. wind, which hauled to W. in the straits. Found a six knot-current setting through, and of course quite a turbulent sea. At noon, Cape Good Success bore S. W. $\frac{1}{2}$ W., and Cape St. Bartholomew (Staten Land) E. $\frac{1}{2}$ N. (per compass). Clear in the straits, but cloudy over the land. Barometer falling gradually, with a continued light breeze and pleasant weather.

March 14. Lat. 55° 56′ S.; long. 64° 18′ W. Current (per hour), $\frac{1}{2}$ knot, N. E. Barometer, 29.25; temperature of air, 46°; of water, 44°. Winds: W., W. S. W., S. W. by W. Begins with light airs and calms. At 4 P. M. a fresh breeze sprung up at W. S. W., which soon became a gale. Middle, hard gales and harder squalls. Latter, more moderate. Saw cape pigeons and other birds.

March 15. Lat. 56° 05′ S.; long. 63° 34′ W. Barometer, 29.60; temperature of air, 42°; of water, 44°. Winds: S. S. W., S. S. W. Hard gales and heavy squalls; wind from S. S. W. to S.; wore ship twice; wind and sea gradually increasing; no observation. Barometer rising slowly all day.

March 16. Lat. 55° 25′ S.; long. 63° 35′ W. Barometer, 29.76; temperature of air, 44°; of water, 43°. Winds: S. by W., S., S. by W. Commences with hard gales and squalls, with snow and hail—weather same during the night. At 6 A. M. saw Staten Land bearing from N. W. to N.; wore ship to the S. E.; latter part, moderating, but squally; found 40 miles northward in the last two days.

March 17. Lat. (bearings) 55° 18′ S.; long. (do.) 63° 35′ W. Current (per hour), 1 knot N., 42° E.

Barometer, 29.82; temperature of air, 43°; of water, 43°. Wind: S.; unsteady winds, and cloudy, with hail, snow, and rain, during first and middle parts; latter part, light winds and cloudy. Tacked twice, and laid up well on both tacks.

March 18. Lat. 57° 08′ S.; long. 63° 34′ W. (D. R.) Barometer, 29.40; temperature of air, 45°; of water, 44°. Winds: S. S. W., W. Begins with light breezes; during the night, unsteady; morning, freshening. Ends with a settled gale from W.; cloudy during the day, with rain the latter part; barometer falling slowly; no observation.

March 19. Lat. 58° 31′ S.; long. 63° 04′ W. (D. R.) Barometer, 29.45; temperature of air, 47°; of water, 43°. Winds: W. S. W., W. by S., W. Hard gales and foggy, with rain squalls; barometer stationary; a rough, irregular sea running.

March 20. Lat. 58° 48′ S.; long. 62° 10′ W. Current (three last days), 52 miles, N. by E. Barometer, 29.55; temperature of air, 45°; of water, 39°. Winds: W. by S., W. S. W., S. W. by W. Hard gales and rainy, with a bad sea running. 4 A. M. moderated for a short time, a little; barometer fell to 28.25.

March 21. Lat. 59° 25′ S. (D. R.); long. 64° 10′ W. (D. R.) Barometer, 29.40; temperature of air, 44°; of water, 40°. Winds: S. W. by W., W., N. W. First, unsteady breezes and foggy, with a heavy sea from S. W.; middle, light N. W. wind; latter, fine N. W. wind and foggy; ship pitching heavily into a head sea.

March 22. Lat. 60° 19′ S.; long. 67° 23′ W. Current, E., 20 miles in two days. Barometer, 29.20; temperature of air, 44°; of water, 41°. Winds: N. W. by W., N. W. by W., W. N. W. Unsteady breezes from W. N. W. to N. W., and foggy throughout.

March 23. Lat. 60° 15′ S.; long. 68° 41′ W. Current, ¾ knot per hour, E. N. E. Barometer, 29.02; temperature of air, 44°; of water, 43°. Winds: W. N. W., W., N. N. W. to W. N. W. Begins with brisk breezes and foggy. 6 P. M. tacked to the northward; middle, light airs, and calm, pleasant. 3 A. M. brisk breeze from N. N. W., tacked to W. Ends squally; plenty of porpoises, penguins, &c. in sight about the ship.

March 24. Lat. 60° 50′ S.; long. 70° 21′ W. Current, 1 knot per hour, E. N. E. Barometer, 28.82; temperature of air, 45°; of water, 41°. Winds: N. W., W. N. W., N. W.; winds unsteady, from N. W. to W. N. W., with squalls, fog, and rain; from a calm to a gale, with some very pleasant weather. Tacked ship twice; a heavy swell from W. S. W.

March 25. Lat. 60° 37′ S.; long. 70° 42′ W. (D. R.) Barometer, 28.26; temperature of air, 43°; of water, 41°. Winds: N. W. by N., W. by N., W. by N. Begins with brisk breezes, rainy, and squally, which gradually increased to a gale with heavy squalls and torrents of rain. 8 P. M. a sudden shift of wind to west: wore to the N. Ends with hard gales and heavy sea running.

March 26. Lat. 59° 27′ S.; long. 70° 14′ W. Barometer, 28.75; temperature of air, 42°; of water, 43°. Winds: W. N. W., W., W. by S. First part, hard gales and squally, with a high sea; middle, hard

squalls with rain, sleet, hail, and snow; latter part, unsteady, but moderating; snow squalls; heavy sea from W. S. W.

March 27. Lat. 58° 03′ S.; long. 71° 06′ W. Barometer, 29.00; temperature of air, 42°; of water, 43°. Winds: W. by N., W. S. W. First part, unsteady breezes with snow squalls; middle, calm; morning, hard gale and hard squalls, from S. W. to W. S. W. Ends with snow and rain; heavy sea running; no current the last two days.

March 28. Lat. 57° 04′ S.; long. 72° 40′ W. Barometer, 29.00; temperature of air, 38°; of water, 44°. Winds: W. by S., baffling, S. by W. First part, hard gales from westward, and squally; 8 P. M. fell calm; barometer, 28.60; light snow falling; middle, light breeze from east, which soon hauled to the south, and increased to a gale; clear weather; passing snow squalls. Barometer rose at 4 A. M. Ends with a hard gale, hard and long snow squalls, and a heavy sea.

March 29. Lat. 56° 08′ S.; long. 74° 42′ W. Current, $\frac{3}{4}$ knot per hour, E. N. E. Barometer, 29.12; temperature of air, 40°; of water, 44°. Winds: S. by W., S. W., S. First part, hard gales and hard snow squalls; middle part, moderate but squally; latter part, strong gales and cloudy.

March 30. Lat. 55° 14′ S.; long. 78° 38′ W. Barometer, 29.25; temperature of air, 42°; of water, 45°. Winds: S. by W., S. W., S. Unsteady gales and cloudy, with snow squalls and a high sea. Barometer fell $\frac{3}{10}$ or $\frac{4}{10}$; rose again. Many birds about.

March 31. Lat. 53° 40′ S.; long. 81° 19′ W. A slight westerly current. Barometer, 29.10; temperature of air, 44°; of water, 46°. Winds: S. W., S. W. by W., S. S. W. to S. First part, light winds and cloudy with light snow squalls; middle part, fresh gales and cloudy; latter part, wind hauling to southward; heavy gale and heavy sea.

April 1. Lat. 51° 42′ S.; long. 85° 09′ W. (D. R.). Barometer, 29.85; temperature of air, 45°; of water, 47°. Winds: S. by E., S., S. by W. First part, hard gales and squally with hail, and a bad sea. Running with wind and sea on the quarter, and shipping much water. Middle, moderating, sea more regular. Ends unsteady gales, cloudy and squally. Barometer rising all day.

April 2. Lat. 49° 58′ S.; long. 88° 22′ W. Barometer, 30.00; temperature of air, 48°; of water, 48°. Winds: S. W. by S., S. W., S. W. Fresh and cloudy.

Ship Esther.

March 7, 1853. Lat. 49° 48′ S.; long. 64° 05′ W. Barometer, 29.20; temperature of air, 51°; Winds: N. W., S. S. W., W. S. W. First part, strong; middle and latter parts, pleasant breezes.

March 8. Lat. 52° 15′ S.; long. 64° 35′ W. Barometer, 28.40. Winds: W. S. W., W. N. W., W. S. W. First part, strong breezes; latter part, moderate.

March 9. Lat. 51° 54′ S.; long. 63° 55′ W. Barometer, 28.20. Winds: W. S. W., W. S. W., S. W. by S. At 9, commenced blowing a hurricane, with a heavy sea. Ship under main spencer, lying to. At 7, shipped a sea breaking adrift water-casks, &c.; barometer ceased to fall. At 3 P. M. began to rise; wind abated a little.

March 10. Lat. 52° 50′ S.; long. 63° 50′ W. Barometer, 29.90; temperature of air, 45°; of water, 46°. Winds: S. W., W. S. W., W. S. W. Strong gale; latter part, heavy squalls of hail and rain.

March 11. Lat. 53° 53′ S.; long. 62° 55′ W. Barometer, 29.90; temperature of air, 45°; of water, 46°. Winds: W. S. W., S. W., S. W.; fresh gales.

March. 12. Lat. 54° 20′ S.; long. 63° 25′ W. Barometer, 29.30; temperature of air, 45°; of water, 46°. Winds: S. W., S. S. E., W.; heavy gales and squalls, first part; latter, fresh breeze; made Staten Land at 2 hours 10 min. A. M.

March 13. Lat. 55° 30′ S.; long. 65° 20′ W. Barometer, 28.90; temperature of air, 49°; of water, 45°. Winds: N. W., calm, N. W.; first part, strong breezes and squally looking weather; middle, calm; latter, strong breezes; passed Staten Land at 5 P. M.

March 14. Lat. 56° 23′ S.; long. 65° 00′ W. Current, E., 1 knot per hour. Barometer, 29.00; temperature of air, 44°; of water, 43°. Winds: W. S. W., W. S. W., W. S. W.; first part, light and baffling; at 6 P. M. wind increased suddenly to a very hard gale, with a heavy hard sea from south.

March 15. Lat. 55° 55′ S.; long. 66° 12′ W. Current, N. N. E., 1½ knots per hour. Barometer, 29.40; temperature of air, 42°; of water, 45°. Winds: S., S., S.; heavy gales and squalls.

March 16. Lat. 55° 38′ S.; long. 65° 45′ W. Barometer, 29.50; temperature of air, 42°; of water 45°. Winds: S., S., S.; heavy gales and squalls.

March 17. Lat. 55° 30′ S.; long. 65° 00′ W. Current, N. E., 2 knots per hour. Barometer, 29.50; temperature of air, 50°; of water, 43°. Winds: baffling throughout. We have had 130 miles current, this last 4 days, setting to N. N. E.

March 18. Lat. 57° 10′ S.; long. 65° 30′ W. Barometer, 29.10; temperature of air, 51°; of water, 43°. Winds: S. S. E., W., W. by S.; first part, light and pleasant; latter, heavy gales.

March 19. Lat. 58° 00′ S.; long. 65° 30′ W. Barometer, 29.00; temperature of air, 52°; of water, 41°. Winds: W. S. W., calm, W. S. W.; first and last part, heavy gales with rain; middle part, calm.

March 20. Lat. 58° 06′ S.; long. 65° 00′ W. Current, E. N. E., 1 knot per hour. Barometer, 29.30; temperature of air, 50°; of water, 41°. Winds: W. S. W., W. S. W., W. S. W.; heavy gales and heavy sea.

March 21. Lat. 58° 30′ S.; long. 66° 10′ W. Barometer, 29.10; temperature of air, 50°; of water, 43°. Winds: W. S. W., W. N. W., W.; light breezes, and thick weather.

March 22. Lat. 59° 30′ S.; long. 68° 30′ W. Barometer, 28.90; temperature of air, 50°; of water, 43°. Winds: W. by N., W. N. W., W. by N.; first part, light; latter, good breezes.

March 23. Lat. 60° 17′ S.; long. 72° 15′ W. Current, S. E., ½ knot per hour. Variation, 23° E. Barometer, 28.70; temperature of air, 50°; of water, 42°. Winds: W. N. W., W. N. W., N. W. Fresh breezes.

March 24. Lat. 60° 40′ S.; long. 74° 40′ W. Barometer, 28.2; temperature of air, 49°; of water, 41°. Winds: N. W., W. S. W., N. W. Strong breezes at 4 A. M., for an hour. Latter part, strong gale.

March 25. Lat. 60° 40′ S.; long. 74° 45′ W. Barometer, 27.90; temperature of air, 49°; of water, 41°. Winds: W. N. W., W. N. W., W. Very heavy gales.

March 26. Lat. 59° 28′ S.; long. 74° 00′ W. Current, east, ½ knot per hour. Barometer, 28.40; temperature of air, 50°; of water, 42°. Winds: W. S. W., W., W. Last part, fresh breezes, with squalls.

March 27. Lat. 57° 45′ S.; long. 74° 00′ W. Barometer, 28.50; temperature of air, 47°; of water, 43°. Winds: W., S. W., W. S. W. First part, strong breezes; calm, from 6 P. M. to 10 P. M. Latter part, strong from W. S. W.

March 28. Lat 56° 28′ S.; long. 75° 15′ W. Barometer, 28.90; temperature of air, 45°; of water, 43°. Winds: W., baffling, S. by W. First part, strong breezes and squalls at 6 P. M. to 10 P. M.; baffling from N. to N. E.; at midnight, took heavy squall from south. Latter part, strong gales.

March 29. Lat. 55° 00′ S.; long. 77° 00′ W. Current, east, ½ knot per hour. Barometer, 28.90; temperature of air, 45°; of water, 44°. Winds: S. by W., W. S. W., S. E. First part, strong gales; middle part, moderate; latter part, strong and squally.

March 30. Lat. 52° 56′ S.; long. 80° 00′ W. Barometer, 28.90; temperature of air, 47°; of water, 46°. Winds: S. S. E., S. W., S. S. E. First part, strong breezes, with squalls; middle, light; latter part, strong.

March 31. Lat. 50° 30′ S.; long. 81° 00′ W. Barometer, 28.80; temperature of air, 47°; of water, 46°. Winds: S. W., S. S. W., S. S. W. First part, moderate; latter part, strong gale.

Ship Aldebaran.

March 4, 1853. Lat. 50° 12′ S.; long. 66° 27′ W. Barometer, 29.50; temperature of air; 62°; of water, 56° Winds: variable, N. N. E., N. N. W. First and middle, pleasant; latter part, thunder and lightning.

March 5. Lat. 51° 28′ S.; long. 66° 15′ W. Barometer, 29.90. Winds: S. W., W., N. W. From 4 P. M. to 4 A. M. heavy gales.

March 6. Lat. 53° 18′ S.; long. 65° 11′ W. Barometer, 29.50; temperature of air, 65°; of water, 58°. Wind: variable from north to west. Moderate breezes and pleasant.

March 7. Lat. 54° 26′ S.; long. ——— W. Barometer, 29.20; temperature of air, 54°; of water, 60°. Wind: N. W. Comes in fresh breezes from W. N. W., and cloudy; middle part, same. Lay head to the northward during the night; morning stood to the southward; 9 A. M. clouds lifting; saw the land. At noon, Cape St. John (Staten Land) bore, per compass, S. E. by E., 20 miles.

March 8. No observation. Barometer, 28.70; temperature of air, 56°; of water, 52°. Winds: W. N. W., W. N. W., N. W. Fresh breezes and pleasant. Passed the land about eight miles off. From 8 to meridian, faint airs. Ends pleasant. Barometer falling.

March 9. Lat. 55° 11′ S.; long. ——— W. Barometer, 29.00; temperature of air, 54°; of water, 50°. Winds: N. W., S. W. by W., S. W. by S. Commences with strong gales, with rain, thunder, and lightning; from 5 P. M. to 4 A. M., I think as hard a gale as I ever experienced, and as bad a sea. Baro-

meter, 28.65. At 9 A. M. wind and sea going down; wore ship to the N. W.; ends strong gales, but sea falling, and barometer rising.

March 10. Lat. 55° 33′ S.; long. 62° 38′ W. Barometer, 29.50; temperature of air, 52°; of water, 50°. Winds: S. S. W., W. S. W., S. W. Strong breezes, and pleasant; ends squally.

March 11. Lat. 55° 27′ S.; long. 62° 40′ W. Barometer, 29.50; temperature of air, 45°; of water, 45°. Wind: S. W. Strong gales, and heavy sea.

March 12. No observation. Barometer, 29.45; temperature of air, 48°; of water, 46°. Winds: S. S. E., S. W., N. W. Strong gales, and rough sea.

March 13. No observation. Barometer, 29.40; temperature of air, 44°; of water, 44°. Winds: W. N. W., W., W. Moderate; saw land about Cape Horn.

March 14. No observation. Barometer, 29.85; temperature of air, 45°; of water, 42°. Winds: W., S. W., S. W. by S. Heavy gales, and dirty weather.

March 15. No observation. Barometer, 29.90; temperature of air, 46°; of water, 44°. Winds: S., S., S. S. W. Strong gales, and cloudy.

March 16. Lat. 56° 30′ S.; long. 66° 17′ W. Barometer, 30.00; temperature of air, 48°; of water, 46°. Winds: S., S. S. W., S. S. W. Begins with strong gales; ends more moderate.

March 17. Lat. 56° 31′ S.; long. 67° 16′ W. Barometer, 30.05. Winds: S., S. S. E., S. S. E. Light breezes, and cloudy. At noon, Cape Horn bore N. N. W.

March 18. Lat. 57° 54′ S.; long. 68° 37′ W. Barometer, 29.80; temperature of air, 45°; of water, 44°. Winds: W. S. W., W., W. S. W. Begins faint; ends strong gales, and bad sea.

March 19. No observation. Barometer, 29.80; temperature of air, 50°; of water, 56°. Wind: S. W. Very heavy gales, and bad sea.

March 20. Lat. 57° 51′ S.; long. 66° 26′ W. Barometer, 29.95; temperature of air, 55°; of water, 46°. Winds: W. by S., W. S. W., W. S. W. Strong decreasing gales.

March 21. Lat. 57° 58′ S.; long. 69° 31′ W. Barometer, 29.75; temperature of air, 46°; of water, 42°. Winds: W. S. W., N. W., W. N. W. Light breezes; foggy during the night.

March 22. Lat. 58° 34′ S.; long. 69° 34′ W. Barometer, 29.60; temperature of air, 48°; of water, 44°. Wind: W. N. W. Begins moderate; ends with strong breezes and passing clouds.

March 23. Lat. 59° 02′ S.; long. 71° 25′ W. Barometer, 29.65; temperature of air, 48°; of water, 44°. Wind: W. N. W. Strong breezes, and cloudy.

March 24. Lat. 59° 32′ S.; long. 73° 28′ W. Barometer, 29.50; temperature of air, 48°; of water, 44°. Winds: W. N. W., N. W. by N., N. W. Barometer falling, and other indications of a blow.

March 25. Lat. ——; long. ——. Barometer, 28.75; temperature of air, 44°; of water, 42°. Wind: W. N. W., and variable. Very heavy gale, and tremendous sea.

March 26. Lat. 59° 47′ S.; long. 73° 36′ W. Barometer, 29.30; temperature of air, 45°; of water, 43°. Wind: W. N. W., and variable. Begins heavy gale; ends more moderate.

March 27. No observation. Barometer, 29.40; temperature of air, 46°; of water, 44°. Winds: W. by S., S. S. W., S. W. Strong breezes, and snow squalls.

March 28. Lat. 57° 30′ S.; long. 75° 30′ W. Barometer, 29.60; temperature of air, 50°; of water, 46°. Winds: W. S. W., W. S. W., S. S. W. Strong breezes and snow squalls.

March 29. Lat. 56° 07′ S.; long. 76° 52′ W. Barometer, 29.50; temperature of air, 56°; of water, 54°. Winds: S. S. W., S. W., S. S. E. Begins with snow; ends fine rain.

March 30. Lat. 54° 24′ S.; long. 79° 52′ W. Barometer, 29.50; temperature of air, 50°; of water, 48°. Winds: S. S. W., S. S. W., S. Moderate, with snow squalls; ends pleasant.

March 31. Lat. 52° 10′ S.; long. 81° 52′ W. Barometer, 29.40; temperature of air, 50°; of water, 46°. Wind: S. S. E. Latter part, heavy gale of wind; lying to.

April 1. Lat. 50° 28′ S.; long. 84° 40′ W. Barometer, 29.90; temperature of air, 54°; of water, 52°. Wind: S. S. E. Begins with a heavy gale; ends with fine breezes.

Sea Serpent (Howland), New York to San Francisco, forty-one days out.

March 26, 1853. Lat. 49° 2′ S.; long. 64° 36′ W. Barometer, 29.60; temperature of air, 62°; of water, 55°; water, 18 feet below the surface, 56°. Winds: N., N. W., S. W. First and middle parts, brisk and pleasant; latter, light and fine weather; forty-one days out.

March 27. Lat. 51° 32′ S.; long. 65° 20′ W. Barometer, 29.60; temperature of air, 52°; of water, 54°; water, depth 18 feet, 54°. Winds: N. N. W., N. W., W. S. W. Moderate and clear first part; middle, brisk, unsteady and gusty; latter, a hard gale and squally.

March 28. Lat. 52° 24′ S.; long. 66° 00′ W. Barometer, 29.10; temperature of air, 45°; of water, 49°; water, depth 18 feet, 48½°. Winds: W. S. W., W., S. W. Moderate gale and unsettled, first part; middle, unsteady; latter, strong gale and passing clouds.

March 29. Lat. 44° 06′ S.; long. 65° 26′ W. Barometer, 29.10; temperature of air, 43°; of water, 45°. Winds: W. S. W. throughout. First part, strong gale and passing clouds; middle, more moderate and squally. Ends light. At noon, Cape St. Diego, N. N. W. 32 miles. The whole land covered with snow.

March 30. Lat. 54° 46′ S.; long. 65° 12′ W. Barometer, 29.10; temperature of air, 45°; of water, 47°. Winds: W. S. W., S. W. to S. S. E., S. W. to S. S. E. Moderate breezes, all night; light baffling winds and snow squalls. Ends same. At noon, Diego N. N. W. 6 miles; S. W. point Staten Land, S. E. ½ E. true.

March 31. Lat. 55° 00′ S.; long. 65° 20′ W. Barometer, 29.10; temperature of air, 45°; of water, 46°. Wind: variable from S. S. E. to S. W. Variable squalls of snow; the tide set through the straits until 5 P. M.; being in mid passage got into a strong rip, and although we had a five-knot breeze, our vessel was unmanageable for an hour, until we cleared it. The current then set us back, but the wind coming off the land light, we kept our ground until the morning's tide. I have my doubts if it is always advisable to attempt this strait; it has detained us full three days; we could have reached the east of Staten Land much sooner with a free sail; at any rate, our detention in rounding the island could not have been

more. After passing the strait, the wind inclined south, so that we could not make a W. S. W. course to have cleared the land on the starboard tack. At noon, Cape Good Success bore N. W. 6 miles.

Let us see how the case really was, and if the Sea Serpent really did lose "full three days" by going through the Straits of Le Maire.

The Golden Racer (p. 544), at the same time, was on the same voyage, and she was directly east of the Sea Serpent, March 28. March 29, the Sea Serpent was 68 miles farther to the south; on the 30th, she was 86; 31st, she was 74; and April 1, she was 80 miles farther south, and 6° farther west than her competitor.

The Sea Serpent got clear of the cape, crossing the parallel of 50° in the Pacific two days ahead of the Racer. This, I am sure, does not look like a loss of three days in the straits, but more like a gain of two.

March 30, the Simoom (Smith), beat through Straits of Le Maire. On the 31st, she was just 34 miles south of the Sea Serpent. She hugged the land close, and, on April 13, was in 49° 32′, and 90° 10′ W., which was nearly a degree ahead in latitude, and in a much better position in longitude.

I quote the abstract log of the Golden Racer, that those who choose may compare the two. It will be perceived that she passed east of the Falklands.

The Sword-Fish (Collins), was also along there at the same time. She was forced east of the Falklands March 29, lat. 51° 53′, long. 57°. April 2, she had only got as far as 55° S., and 63° W.

April 1. Lat. 55° 50′ S.; long. 66° 14′ W. Barometer, 29.20; temperature of air, 45°; of water, 43°. Winds: N. W. to W. N. W.; variable, E. to S. S. E.; light and unsteady; fine weather; variable and squally; at noon, cape in sight 35 miles distant; 48 days out.

April 2. Lat. 56° 37′ S.; long. 67° 16′ W. Barometer, 29; temperature of air, 46°; of water, 44°. Winds: all around the compass, calm, N. W.; variable, four times round the compass, and snow squalls all night; calm, and hail, sleet, and snow; at 7 A. M., a breeze from N. W.; at noon, W. S. W.; at noon, cape bore N. 38 miles; saw it at 10 hours 30 min. A. M.; land entirely covered with snow.

April 3. Lat. 57° 08′ S.; long. 67° 10′ W. Barometer, 28.50; temperature of air, 40°; of water, 41°. Winds: W., W. S. W., S. W.; strong breezes, hail, snow, and rain all night; strong gales, and squally; latter, more pleasant, with an occasional snow squall.

April 4. Lat. 56° 37′ S.; long. 67° 40′ W. Barometer, 28.70; temperature of air, 39°; of water, 40°. Winds: S. W. by W., S. S. W., W. S. W., and variable; strong and squally; middle, moderate; latter, variable, all round the compass.

April 5. Lat. 58° 17′ S.; long. 68° 08′ W. Barometer, 28.60; temperature of air, 40°; of water, 40°. Winds: W. S. W., W., N. W. to N. E.; strong and squally; middle, more moderate; latter, light snow and hail.

April 6. Lat. 58° 04′ S.; long. 69° 00′ W. Barometer, 28.30; temperature of air, 44°; of water, 42°. Winds: S. W., W., W. N. W.; strong squalls, hail, and snow; middle, same; latter, more pleasant.

April 7. Lat. 57° 48′ S.; long. 71° 02′ W. Barometer, 29; temperature of air, 39°; of water, 41°. Winds: N. W., W. N. W., W. S. W.; light and variable; middle, rain, strong winds. Ends squally.

April 8. Lat. 57° 18′ S.; long. 73° 11′ W. Barometer, 29; temperature of air, 40°; of water, 41°. Winds: W., W. S. W., N. N. W.; brisk gale; middle, moderate; latter, strong gales, heavy head sea.

April 9. Lat. 57° 28′ S.; long. 75° 00′ W. Barometer, 29; temperature of air, 42°; of water, 42°. Winds: N. N. W., calm, calm. Commences strong; calm from 9 P. M. to noon, with a cross swell and light rain.

April 10. Lat. 55° 13′ S.; long. 77° 10′ W. Barometer, 29.30; temperature of air, 42°; of water 42°. Winds: W. N. W., W. S. W., W. S. W.; light and steady; middle and latter, brisk, and fine weather.

April 11. Lat. 53° 13′ S.; long. 79° 20′ W. Barometer, 30; temperature of air, 43°; of water, 43°. Winds: S. W., W. S. W., calm. Moderate breezes and fine weather; middle part, hazy.

April 12. Lat. 52° 35′ S.; long. 81° W. Barometer, 29.70; temperature of air, 48°; of water, 44°. Winds: N. W., and N. N. W. Moderate breezes and fine weather; middle part, strong breezes and rainy hazy weather.

April 13. Lat. 50° 34′ S.; long. 81° 25′ W. Barometer, 30; temperature of air, 50°; of water, 47°. Winds: W., S. W., and calm. Weather light and misty; latter part, calm; a heavy head sea.

May 7. Lat. 5° N.; long. 106° 43′ W. Barometer, 29.70. Current, 50 miles, N. W. Temperature of air, 78°; of water, 82°. Winds: S. E. by S., S. E., S. by E. Moderate breezes and unsteady faint lightning in the N. E.; we have experienced a strong current, which is uncommon in these parts, and only encountered off the Cape of Good Hope.

May 8. Lat. 7° 55′ N.; long. 108° 10′ W. Current, 12 miles, N. E. Barometer, 29.70; temperature of air, 80°; of water, 82°. Winds: S. S. E., S. by W., S. W. Moderate breezes and pleasant; middle part, variable breezes and squally appearances, with rain.

May 9. Lat. 9° 52′ N.; long. 109° W. Current, 20 miles, W. N. W. Barometer, 29.70; temperature of air, 83°; of water, 85°. Winds: W. S. W., W. S. W., W. Moderate breezes and squally, with rain; latter part, calm.

May 10. Lat. 11° N.; long. 109° 23′ W. Barometer, 29.70: temperature of air, 83°; of water, 84°. Winds: W., variable, N. W. Moderate breezes and squally; latter part, steady and pleasant. At 5 P. M. Clifferton Rock bore N. N. W. ½ W., just visible from the deck, 15 miles distant. This island, in the track of outward-bound vessels, is about one hundred and fifty feet high, of a conical shape. Care should be taken when approaching it at night. We passed to the northward of it in moderate clear weather, when the roar of the surf warned us of our near proximity. We could not see the island distinctly, but what we supposed to be a white cloud, proved in the morning to be the island, bearing E. N. E., 7 miles distant.

May 11. Lat. 11° 53′ N.; long. 109° 20′ W. Barometer, 29.75; temperature of air, 78°; of water 84°. Winds: N. W., N. E. and calm, N. E. Light baffling winds and calm; throughout the night thunder and lightning; latter part, moderate breeze and pleasant; appearance of a trade-wind.

May 12. Lat. 14° 04′ N.; long. 111° 21′ W. Barometer, 29.75; temperature of air, 83°; of water,

85°. Winds: N. E., N. E. by E., and N. E. First part, light breezes and squally; middle part, moderate and unsteady, with rain; ends, pleasant.

Golden Racer (B. M. Melcher), Boston to San Francisco.

March 26, 1853. Lat. 48° 49′ S.; long. 54° 05′ W. Barometer, 29.80; temperature of air, 55°; of water, 47°. Winds: E. S. E., E., N. W. First and middle, moderate breezes; latter part, fresh breezes.

March 27. Lat. 51° 30′ S.; long. 55° 50′ W. Barometer, 29.40; temperature of air, 44°; of water, 44°. Winds: N. W. to S. W., S. W., N. W. Commences with strong breezes; middle part, moderate. Ends with strong breezes and heavy squalls.

March 28. Lat. 52° 27′ S.; long. 56° 37′ W. (D. R.). Barometer, 29.20; temperature of air, 44°; of water, 44°. Winds: W. by S., W. by S., W. by N. First part, strong gales with hail squalls, lying to; middle and latter parts, more moderate. Barometer fell $\frac{2}{10}$ in four hours.

March 29. Lat. 52° 58′ S.; long. 56° 42′ W. Barometer, 29.20; temperature of air, 38°; of water, 43°. Winds: W. by S., W. by S., W. by S. Strong gales and heavy squalls varying from W. N. W. to S. W., accompanied by hail.

March 30. Lat. 53° 50′ S.; long. 57° 36′ W. Barometer, 29.00; temperature of air, 38°; of water, 42°. Winds: S. W., N. to E., S. W. Commences with strong breezes and hail squalls; middle, light and variable, and thick snowy weather. Ends fresh breezes and passing clouds.

March 31. Lat. 53° 46′ S.; long. 58° 58′ W. Barometer, 29.30; temperature of air, 43°; of water, 43°. Winds: S. E., calm, S. W. Light baffling airs.

April 1. Lat. 54° 30′ S.; long. 60° 30′ W. Barometer, 29.45; temperature of air, 40°; of water, 44°. Winds: S. W. by S., calm, S. E. to N. E. First, light; middle, calm; latter, moderate breezes with fine weather; whales in sight daily during the last three days; water colored.

April 2. Lat. 55° 19′ S.; long. 63° 00′ W. Barometer, 29.40; temperature of air, 40°; of water, 42°. Winds: N. E., N. W. to. S. S. E., S. S. E. to N. W. Commences with moderate breezes; middle part, hail squalls. Ends light and variable. Staten Land in sight.

April 3. Lat. 56° 42′ S.; long. 64° 37′ W. Barometer, 28.80; temperature of air, 39°; of water, 39°. Winds: W. by N., S. W., W. S. W. Commences with fresh breezes; middle and latter parts, heavy snow and hail squalls and southwest swell.

April 4. Lat. 56° 17′ S.; long. 64° 35′ W. Barometer, 29.00; temperature of air, 41°; of water, 41°. Winds: S. W., S., W. S. W. First and middle parts, heavy snow and hail squalls. Ends with light airs.

April 5. Lat. 57° 30′ S.; long. 65° 00′ W. (D. R.). Barometer, 28.80; temperature of air, 40°; of water, 40°. Winds: W. N. W., W. S. W., W. by N. First and middle, heavy snow and hail squalls. Ends moderate.

April 6. Lat. 56° 49′ S.; long. 64° 20′ W. Barometer, 29.55; temperature of air, 40°; of water, 41°.

Winds: W.N.W., S.W., W.N.W. Commences with strong breezes; during the afternoon and night, hard gales. Ends light airs.

April 7. Lat. 57° 29′ S.; long. 67° 35′ W. Barometer, 29.00; temperature of air, 40°; of water, 41°. Winds: W.N.W., N.W. by W., W.N.W. to S.W. Commences with light airs; middle part, fresh breezes. Ends moderate, variable, and thick.

April 8. Lat. 57° 32′ S.; long. 67° 40′ W. Barometer, 29.40; temperature of air, 47°; of water, 42°. Winds: S.W. by W., S.W. by W., S.W. to N.W. First and latter parts, variable airs; middle part, fresh breeze. For ten or twelve days have had a current of about one knot to N.E. or E.N.E. To-day have found, by good observations, thirty-five miles current E.N.E. true.

April 9. Lat. 57° 30′ S.; long. 72° 40′ W. Barometer, 29.10; temperature of air, 44°; of water, 41°. Winds: W.N.W., N.W., N.N.W. Commences with fresh breezes; middle and latter parts, fresh breezes and squally thick misty weather.

April 10. Lat. 56° 36′ S.; long. 74° 00′ W. Barometer, 29.70; temperature of air, 40°; of water, 42°. Winds: S.W., S.W., S.S.W. First and middle parts, light breezes; heavy sea from westward. Ends with fresh breezes and squally weather.

April 11. Lat. 54° 17′ S.; long. 76° 36′ W. Barometer, 30.15; temperature of air, 44°; of water, 42°. Winds: S.W., S.W., W. First part, strong breezes; middle, moderate; latter, light and variable.

April 12. Lat. 54° 58′ S.; long. 80° 36′ W. (D.R.). Barometer, 29.70; temperature of air, 40°; of water, 41°. Winds: W. by N., N.W., W.N.W. Begins moderate; middle and latter parts, thick misty weather.

April 13. Lat. 53° 27′ S.; long. 82° 20′ W. Barometer, 30.00; temperature of air, 42°; of water, 43°. Winds: S.E., S.E. to N.E., N. First part, calm and light breezes; middle, fresh breezes. Ends moderate, variable breezes, and cloudy.

April 14. Lat. 52° 16′ S.; long. 85° 42′ W. Barometer, 30.00; temperature of air, 42°; of water, 44°. Winds: N.W., N.W. to S., S.W. Begins with thick rainy weather; middle, strong breezes. Ends moderate; during the night the barometer fell to 29.50.

April 15. Lat. 49° 54′ S.; long. 86° 15′ W. Barometer, 30.10; temperature of air, 44°; of water, 47°. Winds: W.S.W., W.S.W., S.W. Commences with fresh breezes and thick weather; middle, moderate. Ends with light airs and passing clouds.

Governor Morton (John A. Bergin), forty-nine days out.

March 29, 1853. No observation. Barometer, 29.14; temperature of air, 52°; of water, 51°. Winds: N.W., N.W., S.E. Commences with a fresh breeze; from 7 to 8 P.M. much chain and flash lightning at N.W., and some thunder, without much increase of wind; middle part, quite moderate; ends light breezes and drizzling rain; passed several tide rips.

March 30. Lat. 43° 31′ S.; long. 59° 33′ W. Barometer, 28.94; temperature of air, 54°; of water, 52°. Winds: S.E., N.E., N.W. Wind unsteady, with thick fog, except at intervals; first part, light

winds; middle, fresh; latter, moderate, with one hour of clear sky; numerous tide rips setting apparently N. E.; 30 miles current in the last two days.

March 31. Lat. 43° 51′ S.; long. 59° 36′ W. Barometer, 29.10; temperature of air, 50°; of water, 51°. Winds: N. W., calm, N. W. First part, light breezes and pleasant; middle, baffling and calm, with fog; latter, baffling and light; much lightning and thunder to the south; 8 A. M., heavy fall of hail, with but little wind from the south; soon after which, it cleared, with a light westerly air. Current to N. E., 30 miles; passed several tide rips.

April 1. Lat. 45° 09′ S.; long. 60° 42′ W. Barometer, 28.92; temperature of air, 57°; of water, 54°. Winds: W. to W. S. W., N. W., W. by N. First part, baffling, with squally appearances at S. S. W.; middle part, with lightning; latter, a strong west wind, and pleasant.

April 2. Lat. 46° 17′ S.; long. 61° 30′ W. Barometer, 29.13; temperature of air, 46°; of water, 52°. Winds: W. by S., S. S. W., S. S. W. First part, strong and squally; middle, more moderate; latter, fresh, with rain.

April 3. Lat. 47° 18′ S.; long. 62° 11′ W. Barometer, 29.02; temperature of air, 53°; of water, 53°. Winds: S. W. by S., W. S. W., W. by S. First and middle parts, fresh breezes and squally; latter part, fresh breezes and pleasant.

April 4. Lat. 47° 52′ S.; long. 63° 08′ W. Barometer, 29.00; temperature of air, 51°; of water, 52°. Winds: W., S. S. W., W. First part, strong breezes and squally, with lightning to the S. S. W.; barometer, fluctuating 1.6 inches; middle part, with rain; at 10 P. M. barometer 28.80; latter, strong moderating wind, with a large sea from S. S. W.

April 5. Lat. 49° 03′ S.; long. 62° 33′ W. Barometer, 29.54; temperature of air, 51°; of water, 30°. Winds: S. W., S. S. W., W. Strong breezes and pleasant.

April 6. Lat. 50° 40′ S.; long. 63° 31′ W. Barometer, 29.50; temperature of air, 51°; of water, 48°. Winds: W., S. W. by W., W. S. W. Moderate and pleasant, first part; middle, light airs and dew; latter, light airs and pleasant.

April 7. Lat. 53° 26′ S.; long. 63° 55′ W. Barometer, 28.92; temperature of air, 50°; of water, 46°. Winds: N., N., N. N. W. First, light airs and pleasant; middle, fresh and overcast; latter, light winds, drizzling, and foggy; no observation.

April 8. Lat. 54° 25′ S.; long. 63° 00′ W. Barometer, 28.90; temperature of air, 44°; of water, 44°. Winds: N. N. W., S. W. to S. E., S. E. First part, light airs and foggy; middle, fresh breezes and overcast; latter, light breeze and clear weather; tide rips; current setting N. E.

April 9. Lat. 54° 41′ S.; long. 64° 35′ W. Barometer, 29.04; temperature of air, 46°; of water, 48°. Winds: S. E., calm, W. N. W. First part, light winds and pleasant; many tide rips; middle, calm and pleasant; latter, moderate and pleasant.

April 10. Lat. 56° 00′ S.; long. 66° 45′ W. Barometer, 29.00 temperature of air, 48°; of water, 49°. Winds: N. N. W., N. W. by N., N. Fresh, moderate, and light breezes, and pleasant weather.

April 11. Lat. 56° 11′ S.; long. 69° 53′ W. Barometer, 29.53; temperature of air, 44°; of water,

48°. Winds: S. S. E., S. S. E., S. Commences with fresh breezes, with rain and thick fog; ends moderate, with snow squalls.

April 12. Lat. 56° 48′ S.; long. 72° 56′ W. Barometer, 29.30; temperature of air, 45°; of water, 45°. Winds: S. S. W., W. S. W., N. W. by W. First part, moderate breezes and pleasant; middle, light airs and calm; latter, strong and rainy.

April 13. Lat. 55° 56′ S.; long. 75° 48′ W. Barometer, 29.50; temperature of air, 42°; of water, 45°. Winds: W. S. W., S., S. E. Light and moderate unsteady winds, with, during the first and middle parts, rain and mist; ends pleasant.

April 14. Lat. 55° 02′ S.; long. 79° 00′ W. Barometer, 29.20; temperature of air, 44°; of water, 45°. Winds: N. W., N. W., S. S. W. Commences and ends with light breezes; during middle part, fresh and light winds and rainy.

April 15. Lat. 53° 06′ S.; long. 81° 10′ W. Barometer, 29.46; temperature of air, 42°; of water, 46°. Winds: S. W., S. W. by S., S. W. Fresh and moderate breezes and cloudy, with squalls and some rain.

April 16. Lat. 51° 17′ S.; long. 82° 54′ W. Barometer, 29.66; temperature of air, 43°; of water, 48°. Winds: S. W. throughout. Fresh, moderate, and light breezes, and cloudy, squally weather.

April 17. Lat. 50° 10′ S.; long. 84° 19′ W. Barometer, 29.50; temperature of air, 45°; of water, 48°. Winds: S. W. throughout. Moderate and light baffling winds and cloudy weather.

Paragon (Samuel Duncan), New York to San Francisco.

April 17, 1853. Lat. 50° 19′ S.; long. 62° 16′ W. Temperature of air, 46°; of water, 46°. Winds: S. W., S. W., W. S. W. Comes in strong, with passing clouds; middle part, strong, with snow squalls; ends, blowing hard; close-reefed topsails; heavy head sea.

April 18. Lat. 51° 13′ S.; long. 62° 34′ W. Temperature of air, 48°; of water, 46°. Winds: W. S. W., W. S. W., W. Strong breezes and clear; heavy head sea; stood four hours to the N. W.

April 19. Lat. 52° 42′ S.; long. 62° 46′ W. Temperature of air, 47°; of water, 46°. Winds: W. by S., W. by S., W. by S. Strong breezes; ends, hazy and overcast.

April 20. By bearings, lat. 54° 50′ S.; long. 65° 10′ W. Temperature of air, 46°; of water, 46°. Winds: W. by S., W. by N., W. Commences brisk and clear; middle, do. until 2 A. M., when it became cloudy, with small rain; 4 A. M., under close reefs; 8 A. M., saw Cape St. Diego, S. S. W., distant 4 leagues; at 10 A. M., it bore west; at noon, Good Success Bay bore west; a moderate southerly tide; mountains covered with snow. Ends moderate, thick, and rainy. Seventy days out.

April 21. Lat. 55° 59′ S.; long. 63° 44′. Temperature of air, 40°; of water, 38°. Winds: S. W., S. W., W. S. W. Commences light; at 1 P. M., calm, and the tide ahead; I was afraid of drifting back through the straits. At 3 P. M., the breeze sprung up, and enabled us to clear the land before dark. Middle, wind increasing, with snow squalls; ends heavy gales with snow. Lying to.

April 23. Lat. 25° 46′ S.; long. 65° 08′ W. Temperature of air, 38°; of water, 40°. Winds:

S. S. E., S. E., calm. Commences fresh, with appearances of better weather; middle, moderate; ends calm and cloudy. No observation. Land in sight, bearing north.

April 24. Lat. 56° 22′ S.; long. 67° 00′ W. Current, east, 1½ miles per hour. Temperature of air, 44°; of water, 46°. Winds: N. E., N. E., N. E. Calm, until 3 P. M., then a light breeze. Middle and latter parts, moderate and fine. At noon, Cape Horn bore N. W. by N., distant 10 leagues.

April 25. Lat. 57° 10′ S.; long. 73° 08′ W. (D. R.). Current, east, 1 mile per hour. Temperature of air, 45°; of water, 42°. Winds: N. E., N. E., N. E. Commences with a moderate breeze, and cloudy. 5 P. M., thick and rainy. Spoke a vessel that sailed 10 days before us. Squally and rainy during the night. Ends strong breezes and cloudy.

April 26. Lat. 56° 47′ S.; long. 76° 37′ W. (D. R.). Current same. Temperature of air, 44°; of water, 43°. Winds: N. E., N. N. W., N. N. W. Commences brisk, with beautiful weather; during the night, strong breeze, and thick, rainy weather; ends strong breezes, with a black, heavy appearance.

April 27. Lat. 57° 17′ S.; long. 77° 39′ W. Current, E., ¾ mile per hour. Temperature of air, 44°. of water, 43°. Winds: N. E., N. W., N. W. Commences with strong breezes; middle, strong and squally; ends more moderate.

April 28. Lat. 56° 22′ S.; long. 80° 09′ W. Temperature of air, 43°; of water, 44°. Winds: N. W., N. N. E., E. Commences moderate, with a large ground swell from W. S. W.; middle, fresh and squally, with rain; ends very light, with thick fog.

April 29. Lat. 54° 35′ S.; long. 81° 02′ W. Temperature of air, 44°; of water, 44°. Winds: S., W. S. W., N. W. Commences strong and foggy; middle, moderate; ends light.

April 30. Lat. 54° 40′ S.; long. 83° 27′ W. (D. R.). Temperature of air, 47°; of water, 44°. Winds: N. W., N. W., N. W. First part, moderate, with fog; middle, same, with drizzling rain; ends fresh. Noon, wind veered to west, and the weather cleared.

May 1. Lat. 52° 13′ S.; long. 81° 46′ W. Temperature of air, 47°; of water 48°. Winds: W., W. N. W., N. W. Comes in moderate and fine; middle and latter parts, fresh, with good weather. At 8 P. M. observed a comet, bearing W. S. W., about 15° high.

May. 2. (D. R.) lat. 50° 41′ S.; long. 79° 48′ W. Current, N., ½ mile per hour. Winds: N. W., W. N. W., W. by N. First part, fresh and cloudy; middle and latter, strong, with thick and dirty weather.

May 3. (D. R.) lat. 49° 13′ S.; long. 79° 00′ W. Current, ¾ mile per hour, N. Temperature of air, 50°; of water, 51°. Winds: W., W., W. S. W. Strong breezes, with thick, rainy weather during the night.

Herculean (W. M. Chamberlin).

April 20. Lat. 50° 18′ S.; long. 65° 01. W. Barometer, 29.48; temperature of air, 47°; of water, 46°. Winds: calm, N. N. W., N. W. Middle and latter parts, fresh breezes.

April 21. Lat. 52° 25′ S.; long. 65° W. Barometer, 29.38; temperature of air, 43°; of water, 44°. Winds: W. N. W., S. W., S. W. by S. First part, fresh breezes and pleasant; middle, strong winds and

cloudy, with some rain. Barometer fell to 29.12, and when it commenced rising, the wind hauled to S. W. Ends, strong winds, with heavy squalls of hail, snow, and rain.

April 22. Lat. 52° 38′ S.; long. 63° 55′ W. Barometer, 29.50; temperature of air, 36°; of water, 44°. Winds: S. S. W., S. S. E., S. E. First part, strong winds and heavy sea; middle, more moderate; ends cloudy, with light winds.

April 23. Lat. ——; long. ——. Barometer, 29.65; temperature of air, 36°; of water, 42°. Winds: S. E., E. S. E., N. E. Commences light winds and cloudy; middle part, light winds and calm; latter part, light airs and thick.

April 24. Lat. 55° 19′ S.; long. (bearings) 65° 15′ W. Barometer, 29.66; temperature of air, 40°; of water, 44°. Winds: N., N. N. W., N. E. Commences thick and light winds; middle, fresh winds, thick and rainy. 7 A. M. entered the Straits of Le Maire; 7 hours 30 min. St. Diego bore W. N. W. When the weather cleared, saw Staten Land bearing E. N. E. Ends, strong winds and squally, with rain.

April 25. Lat. ——; long. ——. Barometer, 29.40; temperature of air, 40°; of water, 42°. Winds: E. N. E., E. N. E., N. E. Strong winds and thick rainy weather.

April 26. Lat. 56° 24′ S.; long. ——. Barometer, 29.40; temperature of air, 40°; of water, 42°. Winds: N. E., N., N. W. First part, strong winds, and cloudy; middle and latter parts, strong gales and squalls of hail and rain.

April 28. Lat. 56° 18′ S.; long. 78° 4′ W. Barometer, 29.05; temperature of air, 42°; of water, 41°. Winds: N., N. E., calm and variable. Commences strong winds and cloudy; 4 P. M. more moderate; 8 P. M. strong winds and squally; barometer fell to 28.92; ends, light airs and calm. Dead reckoning puts the ship in 80° 15′ W., consequently, we have had an easterly current.

April 29. Lat. 55° 6′ S.; long. 79° 20′ W. Barometer, 29.80; temperature of air, 43°; of water, 42°. Winds: S., S. W., W. N. W. Begins with light winds and cloudy; middle, strong breezes; ends, light winds and calm.

April 30. Lat.——; long.——. Barometer, 29.75; temperature of air, 44°; of water, 42°. Winds: N. W., N. W., N. N. W. Fresh breezes and foggy, with a drizzling rain.

May 1. Lat.——; long.——. Barometer, 29.90; temperature of air, 43°; of water, 42°. Winds: W. S. W., W., N. W. 1 P. M. the weather cleared; middle and latter parts, fresh breezes and thick.

May 2. Lat.——; long.——. Barometer, 29.75; temperature of air, 45°; of water, 43°. Winds: N. W., W. N. W., W. N. W. Strong winds, and thick, rainy weather.

May 3. Lat. 52° 54′ S.; long. 81° 30′ W. Barometer, 29.38; temperature of air, 44°; of water, 44°. Winds: calm, W. S. W., W. S. W. Middle part, fresh winds, with rain squalls; ends, strong gales and clear; ship leaking badly.

May 4. Lat.——; long.——. Barometer, 29.51; temperature of air, 44°; of water, 43°. Winds: W. S. W., S. W., S. W. Begins strong winds and clear weather; middle, heavy gales and hard squalls; ends moderate and thick.

May 5. Lat. ——; long. ——. Barometer, 29.49; temperature of air, 48°; of water, 46°. Winds: W., W. N. W., W. N. W. Strong winds and thick weather; ends strong gales.

May 6. Lat. ——; long. ——. Barometer, 29.44; temperature of air, 50°; of water, 48°. Winds: N. W. by W., N. W. by W., W. N. W., and baffling. First and middle parts, strong gales and thick rainy weather; ends with baffling winds and rain.

New York (David C. Baxter).

April 22, 1853. Lat. 50° 55′ S.; long. 57° 00′ W. Barometer, 28.09; temperature of air, 38°; of water, 42°. Winds: S. S. W., S. W., S. S. W. First part, a moderate breeze; at 8 P. M. wind increasing; midnight, blowing a heavy gale; at 8 A. M. moderating; ends with a moderate breeze.

April 23. Lat. 50° 48′ S.; long. 61° 36′ W. Barometer, 29.01; temperature of air 40°; of water, 43°. Winds: S. by W., S. by E., S. First part, strong breezes and smooth sea, with snow; middle part, brisk breeze; ends pleasant; made the Jason Isle (Falkland Islands) bearing S. S. W. 12 miles.

April 24. Lat. 52° 14′ S.; long. 63° 12′ W. Barometer, 29.00; temperature of air, 40°; of water, 41°. Winds: W., N. N. W., N. N. E. From 1 to 6 P. M., calm; then a breeze from west; middle part, brisk breezes; latter part, strong breezes and thick weather; saw fin-back whales.

April 25. Lat. 56° 10′ S.; long. 63° 30′ W. Barometer, 29.01; temperature of air, 38°; of water, 40°. Winds: N. N. E., N. N. E., N. N. E. Strong breezes, with snow squalls.

April 26. Lat. 57° 20′ S.; long. 69° 00′ W. Barometer, 28.09; temperature of air, 41°; of water, 41°. Winds: N. N. E., N. E., N. W. Commences a moderate gale; middle, heavy squalls; ends brisk breezes.

April 27. Lat. 57° 31′ S.; long. 74° 20′ W. Barometer, 28.05; temperature of air, 40°; of water, 40°. Winds: N. W., N. W., W. N. W. First part, strong increasing breezes; middle part, heavy squalls; ends strong winds, with a heavy S. W. swell.

April 28. Lat. 57° 17′ S.; long. 78° 02′ W. Barometer, 28.06; temperature of air, 40°; of water, 40°. Winds: W. N. W., N. W., N. First part, strong breezes, with a heavy S. W. swell; middle, squally; ends fine weather, light airs.

April 29. Lat. 55° 45′ S.; long. 79° 08′ W. Barometer, 29.01; temperature of water, 42°. Winds: S., W., N. W. Commences, and until 2 P. M. calm; then a good breeze; middle part, occasionally foggy; ends fine; saw a great many whales.

April 30. Lat. 55° 52′ S.; long. 82° 40′ W. Barometer, 29.03; temperature of water, 42°. Winds: N. W., N. W., W. N. W. Foggy; at 11 A. M. wind hauled W. S. W., tacked to N. W.; saw a great many whales; I think, sperm and right.

May 1. Lat. 53° 26′ S.; long. 80° 10′ W. Barometer, 29.04; temperature of air, 42°; of water, 44°. Winds: W. N. W., W. N. W., N. W. by W. Strong head winds.

May 2. Lat. 53° 00′ S.; long. 80° 00′ W. Barometer, 29.00; temperature of air, 42°; of water, 44°.

Winds: W. N. W., W. N. W., W by N. Commences with a strong breeze, which increased to a gale; wore to the northward.

May 3. Lat. 52° 38′ S.; long. 79° 40′ W. Barometer, 29.01; temperature of air, 42°; of water, 44°. Winds: W., W., W. S. W. Commences blowing a gale; more to the S. W.; during the night squally; A. M. more to N. W.; latter part, moderating.

May 4. Lat. 50° 40′ S.; long. 79° 50′ W. Barometer, 29.01; temperature of air, 44°; of water, 44°. Winds: W. S. W., W. S. W., W. S. W. Commences a moderate gale; middle part, squally; ends strong winds.

May 5. Lat. 48° 50′ S.; long. 80° 30′ W. Barometer, 29.00; temperature of air, 48°; of water, 44°. Winds: W. N. W., W. N. W., W. N. W. Commences strong winds; midnight, to S. W.; at 8, tacked to N.; ends a brisk N. W. gale.

Rosario (Caleb Sprague).

May 4, 1853. Lat. 50° 43′ S.; long. 64° 45′ W. Variation, 21° E. Barometer, 29.26; temperature of air, 51°; of water, 56°. Winds: S. W., W., W. S. W. First part, gales, and heavy hail squall; latter part, the same, with a heavy head sea.

May 5. Lat. 53° 07′ S.; long. 64° 07′ W. Current, E., 24 miles. Barometer, 29.20; temperature of air, 56°; of water, 44°. Winds: W. S. W., W., W.; heavy gales throughout; saw several large patches of kelp.

May 6. Lat. 54° 53′ S.; long. 63° 37′ W. Current, E., 14 miles. Barometer, 28.95; temperature of air, 51°; of water, 44°. Winds: W. S. W., N. W., W. N. W. First part, heavy gales; middle part, strong breezes, with rain squalls; at 9 A. M. made Cape St. John, bearing south, distant ten miles; very strong tide rips about the cape, like breakers.

May 7. Lat. 55° 43′ S.; long. 63° 35′ W. Current, N. 45° E., 18 miles. Barometer, 29.25; temperature of air, 54°; of water, 39°. Winds: W. S. W., S. W. by W., W. S. W. First part, moderate; middle part, light air and baffling wind, with a heavy sea from the southwest.

May 8. Lat. 55° 59′ S.; long. 65° 06′ W. Current, N. 72° E., 23 miles. Barometer, 29.63; temperature of air, 46°; of water, 40°. Winds: W. S. W., S. W., N. N. W. First part, strong breeze; middle and latter parts, heavy gales, with rain.

May 9. Lat. 57° 03′ S.; long. 68° 12′ W. Barometer, 29.30; temperature of air, 55°; of water, 42°. Winds: N. N. W., W., W. by N. First part, heavy gales; latter part, strong breeze, a heavy sea.

May 10. Lat. 57° 46′ S.; long. 68° 22′ W. Barometer, 29.40. Current, N. 77° E., 26 miles; temperature of air, 51°; of water, 40°. Winds: W., W. by N., W. by N. First part, heavy gales and squalls, with lightning; latter part, the same.

May 11. Lat. 58° 36′ S.; long. 70° 18′ W. Barometer, 29.28; temperature of air, 51°; of water, 40°. Wind: W. N. W.; strong gales, and heavy squalls of wind and rain.

May 12. Lat. 58° 51′ S.; long. 72° 14′ W. Barometer, 28.84; temperature of air, 50°; of water, 39°. Winds: N. W., N. W., N. N. W.; heavy gales and squalls.

May 13. Lat. 58° 55′ S.; long. 72° 40′ W. Barometer, 28.75; temperature of air, 49°; of water, 49°. Winds: W. N. W., W. N. W., W. S. W.; strong gales, with snow squalls and hail; latter part, violent gales.

May 14. Lat. 57° 51′ S.; long. 71° 33′ W. Temperature of air, 48°; of water, 40°. Barometer, 29.30. Winds: S. W., W. S. W., W.; heavy gale, with snow and hail.

May 15. Lat. 57° 12′ S.; long. 72° 08′ W. Barometer, 29.30; temperature of air, 50°; of water, 40°. Winds: W., W., W. N. W.; strong gales, with heavy squall of wind and rain.

May 16. Lat. 57° 34′ S.; long. 73° 15′ W. Barometer, 29.48; temperature of air, 44°; of water, 38°. Wind: W. N. W. Fresh breezes and passing clouds; latter part, squally. At 4 A. M. wind suddenly shifted to the S. W. in a heavy squall; weather extremely cold.

May 17. Lat. 57° 17′ S.; long. 74° 52′ W. Barometer, 29.38; temperature of air, 40°; of water, 38°. Fresh breezes and passing clouds; latter part, squally.

May 18. Lat. 55° 54′ S.; long. 73° 53′ W. Barometer, 29.78; temperature of air, 48°; of water, 42°. Winds: S. W., W. S. W., and W. S. W. First part, strong gale, and cloudy, squally weather; latter part, light squalls.

May 19. Lat. 55° 12′ S.; long. 77° 26′ W. Barometer, 29.05; temperature of air, 45°; of water, 42°. Winds: W., E. N. E., E. N. E. First part, light airs and calms; middle and latter parts, fresh breezes and heavy gales. I have always noticed that in these latitudes the barometer stands much lower than with other winds.

May 20. Lat. 55° 48′ S.; long. 80° 57′ W. Barometer, 28.30; temperature of air, 51°; of water, 42°. Winds: E. N. E., N., and N. W. First part, heavy gales and heavy rain following; middle part, a perfect hurricane; latter part, strong gales.

May 21. Lat. 55° 17′ S.; long. 81° 18′ W. Barometer, 28.50; temperature of air, 48°; of water, 40°. Winds: N. W., W. N. W., and N. W. First part, light airs, with fog squalls. Middle part, squally; latter part, light airs.

May 22. Lat. 53° 02′ S.; long. 81° 01′ W. Barometer, 29.02; temperature of air, 40°; of water, 42°. Winds: W. N. W., W. S. W., and W. Strong gales and heavy hail squalls.

May. 23. Lat. 49° 58′ S.; long. 80° 45′ W. Barometer, 29.63; temperature of air, 47°; of water, 46°. Winds: W., W. S. W., W. Fresh breezes, and heavy squalls of hail and snow.

Empress of the Seas (M. E. Putnam).

May 8, 1853. Lat. 52° 11′ S.; long. 64° 51′ W. Barometer, 29.72. Winds: S. S. W., W. by N., and W. N. W. Moderate breezes and overcast.

May 9. Lat. 55° 15′ S.; long. 62° 20′ W. Barometer, 29.27; temperature of air, 45°; of water, 41°.

Winds: N. by W., N. N. W., and W. by S.; strong gales; have intended all along to go through the straits, but gales and thick weather will prevent me from doing so. Ends calm; an awful sea on.

May 10. Lat. 56° 12′ S.; long. 65° 38′ W. Current, E., 37 miles. Barometer, 29.50; temperature of air, 43°; of water, 42°. Winds: N. W., N. W., and N. W. by N.; fine weather, and moderate breeze. At 4 P. M. Staten Land bore N., 35 miles distant.

May 11. Lat. 56° 32′ S.; long. 68° 29′ W. Barometer, 29.46. Current, 17 miles, S. E. Variation, 24°; temperature of air, 46°; of water, 45°. Winds: W. by N., N. N. W., and W. S. W. Lovely weather; ship under all sail. At meridian, Cape Horn, proper, bore W. 9 miles. Diego Ramirez W. by S. (true), 9 miles.

May 12. Lat. 57° 29′ S.; long. 72° 39′ W. Barometer, 28.50; temperature of air, 43°; of water, 41°. Winds: N. W. throughout. First part, very pleasant; mercury depressed; at meridian, enjoying the delights of a N. W. gale.

May 13. Lat. 56° 53′ S.; long. 73° 55′ W. Current, east, 20 miles. Barometer, 29.30; temperature of air, 36°; of water, 40°. Winds: N. W., W., and W. S. W. Strong gales and squally, with rain; under close reefs.

May 14. Lat. 57° 23′ S.; long. 75° 01′ W. Barometer, 29.37; temperature of air, 41°; of water, 42°. Winds: W., W. by N., and W. Strong gale and a heavy sea. Barometer, falling and rising very fast.

May 15. Lat. 57° 30′ S.; long. 78° 00′ W. Barometer, 29.28; temperature of air, 42°; of water, 44°. Winds: W., N. W., and N. W. by N. Strong gales; two reefs; thick misty weather; latter part, more moderate.

May 16. Lat. 57° 13′ S.; long. 78° 00′ W. Barometer, 29.50; temperature of air, 41°; of water, 42°. Winds: W., W. S. W., and N. W. by W. Fresh gales and open weather; latter part, moderate gale and pleasant; all sail out.

May 17. Lat. 56° 00′ S.; long. 80° 27′ W. Current, 75 miles east, in four days. Barometer, from 29.88 to 29.65. Winds: from N. and W. Fresh gales and heavy sea; under double reefs.

May 18. Lat. 53° 21′ S.; long. 79° 45′ W. Current, S. E., 25 miles. Barometer, 29.17; temperature of air, 41°; of water, 43°. Winds: W., W., and calm. Strong breezes and frequent squalls; middle part, good breezes and pleasant; latter part, calm; a heavy sea, and tide rips.

May 19. Lat. 50° 25′ S.; long. 83° 17′ W. Barometer, 28.35; temperature of air, 52°; of water, 47°. Winds: N. E., E. N. E., S. E. to S. S. W. First part, increasing breezes at N. E.; under all sail; mercury falling fast; middle part, a gale at E. N. E., and rain; latter part, wind moderate, rainy weather; mercury fell this day 1.42, and no wind to speak of.

Ship Roscoe (Thomas Smith).

May 2, 1853. Lat. 49° 12′ S.; long. 65° 20′ W. Barometer, 30.00; temperature of air, 45°; of water, 46°; water, 8 feet below surface, 46°. Winds: S. S. E., S. S. E., W. N. W. First and middle parts, light

airs and squally; at 6 A. M. calm, on soundings; at 9 A. M. a breeze sprung up from W. N. W. Ends a fresh breeze.

May 3. Lat. 52° 45′ S.; long. 65° 45′ W. Barometer, 29.00; temperature of air, 44°; of water, 44°; water, 8 feet below surface, 46°. Winds: N. W., N. W., S. W. First and middle parts, fresh breezes, and during middle part, cloudy; barometer, falling. In the morning, the wind changed to west and increased. Ends strong gales. My barometer, thus far, is a good indicator.

May 4. Lat. 54° 06′ S.; long. 65° 25′ W. Barometer, 29.00; temperature of air, 42°; of water, 44°; water, below surface, 45°. Winds: S. W., W., W. S. W. Heavy gales. Barometer fell to 28.80; at 10 A. M. made Cape St. Diego, bearing S. E. by compass, distant about 40 miles.

May 5. Lat. 54° 35′ S.; long. 65° 20′ W. Barometer, 29.20; temperature of air, 42°; of water, 43°; water, below surface, 43°. Winds: W. S. W., S. W., S. W. First and middle parts, heavy gales and a heavy sea; at 8 A. M. saw Cape St. Diego bearing S. S. E. by compass; not being able to fetch through the Straits of Le Maire, I shall go round Staten Land. Barometer ranging at about 29; falling on the approach of a squall, and rising after. Ends quite moderate.

May 6. Lat. 55° 42′ S.; long. 65° 05′ W. Barometer, 29.00; temperature of air, 46°; of water, 47°; of water, below surface, 47°. Winds: W. S. W., W., N. W. First part, strong breezes; middle, moderate; and latter, fresh breezes and squally. A very heavy swell from S. S. W.

May 7. Lat. 56° 00′ S.; long. 65° 10′ W. Current, E. N. E., $1\frac{1}{2}$ knots per hour. Barometer, 29.00; temperature of air, 40°; of water, 47°; of water, below surface, 47°. Winds: W. S. W., S. W., N. W. Commences blowing a gale; wind unsteady. At 4 A. M. fell calm; at 8 A. M. light airs. Ends fresh breeze. Barometer on the rise at noon.

May 8. Lat. 56° 39′ S.; long. 64° 45′ W. Current, E. by N., 3 knots per hour. Barometer, 29.00; temperature of air, 44°; of water, 43°; of water, below surface, 43°. Winds: W., S. W., N. Commences with a fresh breeze. At 4 P. M. wind increased to a gale, and changing; bad sea running. At 11 P. M. moderating. Ends heavy gales. Barometer indicates the changes in the weather.

May 9. Lat. 57° 44′ S.; long. 68° 45′ W. Current, E. by N., 41 miles. Barometer, 29.40; temperature of air, 44°; of water, 42°; of water, below surface, 42°. Winds: N., W. to S. W., W. Fresh breezes and sharp squalls. Crew in a state of mutiny.

May 10. Lat. 58° 41′ S. (D. R.); long. 69° 20′ W. (D. R.). Barometer, 29.30; temperature of air, 42°; of water, 40°; of water, below surface, 40°. Winds: W., W. N. W., W. N. W. Heavy gales, veering a point or two east way. Barometer rose and fell $\frac{8}{10}$ during the day.

May 11. Lat. 59° 20′ S. (D. R.); long. 71° 19′ W. (D. R.). Barometer, 29.10; temperature of air, 40°; of water, 41°; of water, below surface, 41°. Winds: W., N. W. by W., N. W. Heavy gales, varying from W. to N. N. W. At noon, wind north with rain; a bad sea running; ship leaking badly. Crew still mutinous; can't get sail handled.

May 12. Lat. 59° 20′ S. (D. R.); long. 73° 10′ W. Barometer, 28.80; temperature of air, 39°; of water, 38°; of water, below surface, 38°. Winds: W., N., N. N. W. Commences with a gale; wearing

ship according to the changes of the wind. At 7 P. M., calm; at 8, light northerly airs; middle part, blowing hard. From 8 to meridian, sharp snow squalls; blowing very hard; ship still leaking badly.

May 13. Lat. 60° 16′ S. (D. R.); long. 74° 50′ W. (D. R.). Barometer, 28.60; temperature of air, 33°; of water, 34°; of water, below surface, 34°. Winds: N., N. W., W. by S. Heavy gales, with sharp snow squalls. Ship making ten inches of water an hour. One of the pumps choked.

May 14. Lat. 58° 24′ S. (D. R.); long. 74° 11′ W. (D. R.). Barometer, 29.20; temperature of air, 39°; of water, 38°; of water, below surface, 38°. Winds: S. W., W. by N., W. by N. Gale still continues, and lasts the whole day. One man washed overboard and drowned. Barometer rose gradually.

May 15. Lat. 58° 25′ S. (D. R.); long. 75° 09′ W. (D. R.). Barometer, 29.27; temperature of air, 41°. of water, 39°; of water, below surface, 39°. Winds: W., W. N. W., N. by W. Gale continues throughout this day; during the middle part, squally with rain. Foggy during the middle and latter parts. At noon, the wind veered to N. W. by W.

May 16. Lat. 58° 45′ S. (D. R.); long. 75° 48′ W. Barometer, 29.47; temperature of air, 39°; of water, 39°; of water, below surface, 39°. Winds: W., W. N. W., N. W. by W. Commences gale still blowing; middle, squally, black heavy clouds. At 10 A. M., quite moderate; bad sea running. The ship's cutwater started by plunging into a head sea. Ends cloudy. No observations for a week.

May 17. Lat. 58° 12′ S. (D. R.); long. 76° 27′ W. Barometer, 29.50; temperature of air, 38°; of water, 38°; of water, below surface, 38°. Winds: W., W. S. W., W. S. W. Commences blowing a gale. At midnight, heavy squally weather. At 4 A. M., a very heavy squall with snow. At 7 A. M., five feet of water in the hold. Put all hands at the pumps, and kept the ship off the wind until she was freed. She leaks at the rate of ten inches per hour.

May 18. Lat. 56° 36′ S.; long. 75° 01′ W. Barometer, 29.80; temperature of air, 41°; of water, 40°; water, below surface, 40°. Winds: W. by S., W. S. W., W. S. W. First part, blowing a gale; middle, more moderate, but very squally, with some rain; latter part, quite moderate. By observation, discovered that in eight days had made 150 miles east of the reckoning. The last 24 hours, we found the current setting south, at the rate of a mile an hour.

May 19. Lat. 65° 20′ S.; long. 76° 21′ W. Current, N., 20 miles. Barometer, 29.00; temperature of air, 42°; of water, 40°; water, below surface, 40°. Winds: W. S. W., calm, S. by E. First part, strong breezes; middle, calm; 11 P. M. light northerly airs; at 8 A. M. fresh gale from N.; at noon, blowing hard from N. E. by E. Barometer fell gradually.

May 20. Lat. 55° 45′ S. (D. R.); long. 80° 33′ W. (D. R.). Barometer, 28.50; temperature of air, 43°; of water, 41°; water, below surface, 51°. Winds: E. N. E., N. W., N. W. First part, a gale; very bad sea; obliged to scud. At 5 hours 30 min. the wind suddenly hauled to N. N. W.; sea breaking over the ship; 4½ feet of water in the hold; both pumps going, and all hands at them. Middle part, still blowing; latter part, more moderate; ends with thick foggy weather, and fine rain. Barometer did not work well.

May 21. Lat. 55° 23′ S. (D. R.); long. 81° 02′ W. (D. R.). Barometer, 28.68; temperature of air 36°;

of water, 41°; of water, below surface, 41°. Winds: N. W., W. N. W., W. N. W. Commences with light airs, with fog and rain; at 10 P. M. calm; 11, light airs from west; 12, sharp snow squalls from S. W.; ends calm, with snow.

May 22. Lat. 53° 56′ S.; long. 81° 30′ W. Barometer, 29.26; temperature of air, 35°; of water, 40°; water, below surface, 40°. Winds: W., W. S. W., W. S. W. Fresh gales and squally, with plenty of snow.

May 23. Lat. 51° 32′ S. (D. R.); long. 81° 33′ W. (D. R.). Barometer, 29.70; temperature of air, 45°; of water, 45°; water, below surface, 45°. Winds: W., W. to W. S. W., W. Fresh increasing gales, with snow, rain, and fog.

May 24. Lat. 49° 15′ S.; long. 81° 50′ W. Barometer, 29.90; temperature of air, 48°; of water, 48°; water, below surface, 48°. Winds: W. by S., W. S. W., S. W. First part, fresh breeze and squally; middle, do.; latter part, fine breeze.

Surprise (Chas. A. Ranlett).

April 27, 1853. Lat. 47° 10′ S.; long. 60° 22′ W. (D. R.). Very little current. Barometer, 29.75; temperature of air, 59°; of water, 45°. Winds: E. S. E., E., E. to N. E.; cloudy, almost calm, and unpleasant weather, first part; at 6 P. M. a breeze sprung up; a heavy sea on; barometer rising slowly; many birds about; saw a white pigeon—he flew a few times and went off; a long, rolling swell from N. E.; great patches of kelp.

April 28. Lat. 50° 04′ S.; long. 62° 59′ W. Barometer, 29.50; temperature of air, 54°; of water, 46°. Winds: N. W., N. W. Light from northward first part, and hauling W. N. W.; latter part, wind N. W., and a fresh breeze—weather like smoky southwester at the north; barometer falling from 29.75 since midnight; lots of birds, yet no Carey chickens; plenty of kelp.

April 29. Lat. 53° 36′ S.; long. 64° 00′ W. Barometer, 29.65; temperature of air, 50°; of water, 46°. Winds: N., N. E., N. E.; strong breezes from the northward, and smoky or hazy weather—cannot see far; middle part, hauling N. E.; intended to have gone through the Straits of Le Maire, but as the wind hauled eastward, must go outside; saw penguins, kelp, &c., and a great many birds and porpoises.

April 30. Lat. 54° 19′ S.; long. 63° 09′ W. (D. R.); much current, by appearances. Barometer, 29.15; temperature of air, 52°; of water, 45°. Winds: E. N. E., N. E., E. by S. At 2 P. M. thick weather, and very bad to run for land; fresh breeze; at 6 P. M. made a high bluff; land has the appearance of an island—took it to be one of the new islands. Tacked and stood off N. N. W.; at midnight, tacked again, E. S. E., and stood over but saw nothing; hauled up south at noon; wind growing light, sea smooth, and strong tide rips; must set strong to the eastward, as I cannot see Staten Land.

May 1. Lat. 54° 46′ S.; long. 63° 06′ W. (D. R.). A strong current, easterly. Barometer, 29.80; temperature of air, 52°; of water, 46°. Winds: N. E., light, calm, calm; light N. E. winds first part, and thick, rainy weather; fog and rain all night; smooth sea, and a very strong current somewhere by the many

tide rips; no sun to be seen since the 29th ult., consequently, cannot find out how much current, nor its course; see penguins.

May 2. Lat. 56° 3′ S.; long. 66° 27′ W. Barometer, 29.50; temperature of air, 50°; of water, 46°. Winds: calm, S. W., W., W. N. W., calm, and thick fog until 4 P. M.; a light breeze sprung up from S. W. by W.; at 8 fine, clear weather. The third mate called me to see a *comet*—a good-sized comet, about 8° S. W. from the middle star of the belt of Orion; latter part, strong W. N. W. wind to sun this day.

May 3. Lat. 57° 3′ S.; long. 66° 1′ W. Current, for four days, easterly, only 1° 5′. Barometer, 28.75; temperature of air, 46°; of water, 42°. Wind: W., W. by S., W. S. W. Commences with a violent gale for a few hours; middle part, more moderate; latter part, violent snow storm, a very heavy sea, thick weather; did not see the comet; good observation; found I had not lost so much as I anticipated—40 miles in three days, current.

May 4. Lat. 57° 41′ S.; long. 65° 52′ W. Very little current. Barometer, 28.40; temperature of air, 43°; of water, 39°. Winds: S. W., W. S. W., W. S. W. Squally weather, snow, hail, rain, &c.; wore ship to southward; middle part, wind very strong in squalls; saw two barques; saw the comet, but a long way N. E. of where we first saw it, in about 12° N. E. of Orion Belt, going very fast to the eastward; latter part, very heavy squalls, as much as a close reef can stand.

May 5. Lat. 58° 13′ S. (D. R.); long. 66° 34′ W. (D. R.). Barometer, 28.40; temperature of air, 41°; of water, 38°. Winds: S. W. by W., W. by S., W. S. W. Strong heavy squalls, with rain, hail, and snow all day and night. Barometer, rose to 28.70; at 4 P. M. fell to 28.30; some three or four of the most terrific squalls I ever witnessed in the night; mastheads, yardarms, every one of them, had a bright light. After 7 A. M. barometer commenced rising; at noon, barometer, 28.50; heavy head sea; no observations; comet not in sight.

May 6. Lat. 57° 47′ S. (D. R.); long. 70° 19′ W. (D. R.) Barometer, 28.50; temperature of air, 41°; of water, 38°. Wind all around the compass. Barometer rose to 28.95 and then fell to 28.50. A squally day with a rough sea. Not able to make much headway.

May 7. Lat. 58° 03′ S.; long. 68° 40′ W. Strong easterly current for the last three days. Barometer, 28.88; temperature of air, 47°; of water, 42°. Winds all around the compass. Cloudy, with rain and very rough head sea. Ship shipping a great deal of water; men breaking down; barometer rising and falling as the day before. Cape Horn is no bugaboo. It is much worse than I expected. 55 days out.

May 8. Lat. 57° 50′ S. (D. R.); long. 69° 30′ W. (D. R.). Appearances of a strong easterly current. Barometer, 29.25; temperature of air, 46°; of water, 45°. Winds: S. W., W. N. W., N. W. Commences squally. At 1 P. M. wind hauled to S. W.; blew a hard gale, and then hauled back to N. W. Barometer from 29.10 to 29.37, and fell to 29.25 as the wind hauled to the westward. Wild looking weather.

May 9. Lat. 58° 25′ S.; long. 72° 52′ W. Barometer, 29.85; temperature of air, 45°; of water, 40°. Winds: N. N. W., W. N. W., W. by N. Stormy, and such a head sea that we cannot get along; several sharp flashes of lightning to S. S. E. of us.

May 10. Lat. 58° 51′ S. (D. R.); long. 73° 50′ W. Barometer, 29; temperature of air, 45°; of water, 41°. Winds: W., W., N. W. Snow squalls and lightning in the south; short S. W. sea; barometer unsteady.

May 11. Lat. 59° 32′ S. (D. R.); long. 73° 46′ W. (D. R.). Current, E. N. E., 30 miles. Barometer, 28.80; temperature of air, 45°; of water, 40°. Winds: W. N. W., W. N. W., N. W. Heavy gales, with hail, rain, snow, &c.

May 12. Lat. 59° 23′ S.; long. 75° 40′ W. Barometer, 28.40; temperature of air, 46°; of water, 39°. Winds: W., N. N. W., W. N. W. Light winds; nearly calm. Barometer fell from 28.90 to 28.40. Latter part, squally, with hail, rain, and snow; wind increasing.

May 13. Lat 58° 09′ S.; long. 76° 25′ W. Barometer, 28.86; Winds: N. and N. W., S. W., S. S. W. to W. S. W. Commences with a gale, with heavy squalls of hail, rain, and snow. Barometer unsteady; squalls the same, without any apparent effect on the barometer; I do not trust to it. At noon a gale at W. S. W.

May 14. Lat. 56° 16′ S.; long. 75° 55′ W. Barometer, 28.90; temperature of air, 48°; of water, 42°; Winds: S. W., W., W. Commences with a strong moderating gale; sea heavy, and breaking over the ship everywhere; trying to get north; it is of no use to try to get to the westward here; barometer acts curiously here, rising and falling very often and very fast.

May 15. Lat. 56° 35′ S.; long. 77° 59′ W. Barometer, 29.20; temperature of air, 44°; of water, 44°. Winds: W. ½ N., N. W. by W., N. W. by W. Commences with thick, stormy weather, with rain, hail, and snow; flashes of lightning. Latter part, more moderate, thick mist, heavy head sea. Barometer falling.

May 16. Lat. 56° 38′ S.; long. 78° 04′ W. Current, 50 miles, the last three days. Thick, cloudy and all sorts of bad weather. Winds: N. W. by W., W. S. W., W. by N. Barometer, 28.90; temperature of air, 52°; of water, 42°.

May 17. Lat. 54° 41′ S. (D. R.); long. 78° 35′ W. (D. R.). Barometer, 29.60; temperature of air, 42°; of water, 42°. Winds: W. N. W., S. W., and W. S. W. Stormy-looking weather; blowing hard in squalls; short head sea.

May 18. Lat. 52° 39′ S.; long. 78° 45′ W. Barometer, 29.90; temperature of air, 48°; of water, 42°. Winds: W., W., variable. Stormy weather; moderated during the night; noon almost calm; at 11 A. M. a light breeze sprung up at E. N. E. Barometer high.

May 19. Lat. 50° 15′ S.; long. 82° 22′ W. Current, S. E., 20 miles. Barometer, 28.35; temperature of air, 54°; of water 48°. Winds: E. N. E., E. N. E., variable. Commences with fine weather; wind soon increased; barometer fell very fast, ranging between 29.80 and 28.35; wind increased to a gale; during the forenoon hauled to the westward, going around by south.

May 20. Lat. 50° 06′ S.; long. 84° 00′ W. Barometer, 28.30; temperature of air, 55°; of water, 48°. Current, 16 miles, south. Winds: N. W., N. W., N. N. W., and S. W., 1 hour. Cloudy and squally; wind

hauling to the northward. Barometer ranges from 28.35 to 28.50, too low to venture much sail. At 11 A. M. wind came out S. W.

May 21. Lat. 48° 08′ S.; long. 83° 15′ W. Barometer, 28.70. Winds: S. W. and W., W. N. W., W. All appearances of a S. W. wind, which amounted to nothing; during the evening rainy; weather generally bad.

Houqua (Richard W. Dixey).

April 25. Lat. 49° 1′ S.; long. 63° 43′ W. Barometer, 29.20; temperature of air, 45°; of water, 49°. Winds: N. W., N. N. E., E. First part, fine winds, and pleasant; middle and latter, strong winds, and cloudy.

April 26. Lat. 52° 14′ S.; long. 64° 06′ W. Barometer, 29.70; temperature of air, 45°; of water, 46°. Winds: E., E., E. N. E.; fine winds, and cloudy. Birds and kelp in abundance.

April 27. Lat. 54° 39′ S.; long. 62° 45′ W. Barometer, 29.60; temperature of air, 44°; of water, 46°. Winds: N. E., N. E., N.; strong winds, and cloudy; middle, strong gales. Lay to for daylight and the land.

April 28. No observation; 64° 45′ W. (D. R.). Barometer, 29.60; temperature of air, 40°; of water, 39°. Winds: N., variable, N. E.; strong winds, and cloudy. At 2 P. M. judged the ship clear of Staten Land; hauled up S. W. by S.

April 29. Lat. 57° 06′ S.; long. 68° 30′ W. Barometer, 29.65; temperature of air, 43°; of water, 43°. Winds: N. N. E., N. N. E., S.; strong winds, and thick weather; middle, moderate and rainy; latter, moderate and foggy.

April 30. Lat. 56° 52′ S. (D. R.); long. 70° 12′ W. Barometer, 30.00; temperature of air, 41°; of water, 43°. Winds: S. S. E., variable, calm, light breezes, and clear; middle, do.; latter, do. and foggy. At 7 P. M. a bright comet, bearing W. S. W. per comp., alt. 10° 20′, in fine view; its range and tail about E. and W. true.

May 1. Lat. 57° 22′ S. (D. R.); long. 72° 22′ W. Barometer, 29.90; temperature of air, 42°; of water, 43°. Winds: calm, W. N. W., variable. First, calm, and thick foggy weather; middle, squally; latter, strong winds and thick.

May 2. Lat. 58° 10′ S. (D. R.); long. 73° 48′ W. Variation observed, 28° 00′ E. Barometer, 29.00; temperature of air, 41°; of water, 43°. Winds: W., W., W.; strong gales, and thick weather; middle, strong gales; latter, strong gales and snow squalls.

May 3. Lat. 57° 15′ S.; long. 72° 18′ W. Current, E., 1 mile per hour. Barometer, 28.84; temperature of air, 39°; of water, 41°. Winds: W. S. W., W. S. W., W. S. W.; heavy gales first part; middle, less wind; latter, squally.

May 4. Lat. 56° 57′ S.; long. 71° 00′ W. Barometer, 28.62; temperature of air, 37°; of water, 41°. Winds: W. S. W., W. S. W., W. S. W.; heavy gales and heavy sea: snow squalls; lying to.

May 5. Lat. 57° 10′ S.; long. 70° 00′ W. Barometer, 28.65; temperature of air, 36°; of water, 42°.

Winds: W. S. W., W. S. W., W. S. W.; heavy gales, with snow squalls at times. At 7 hours 30 min. a violent squall passed over the ship. Apparently at the time of its striking her, a meteor, about the size of a man's head, burst at the masthead, and resembled a large rocket; came down the mainmast and passed off to leeward without doing any damage; thank God for the mercy; ship hove to.

May 6. Lat. 57° 19′ S.; long. 70° 10′ W. Barometer, 28.62; temperature of air, 41°; of water, 42°. Winds: W. S. W., variable, W. S. W.; heavy gales; high sea running; part of the time hove to.

May 7. Lat. 57° 32′ S.; long. 69° 45′ W. Barometer, 28.95; temperature of air, 37°; of water, 43°. Winds: W. S. W., N., W., W. S. W. First part, heavy gales; middle, calm; latter, heavy gales; lying to.

May 8. Lat. ——; long. 71° 30′ W. Current, E., 1 mile per hour. Barometer, 29.60; temperature of air, 41°; of water, 42°. Winds: W. S. W., variable, N. W.; strong gales, and cloudy; high sea.

May 9. Lat. 58° 20′ S.; long. 72° 59′ W. Barometer, 28.80; temperature of air, 40°; of water, 40°. Winds: N. N. E., W. N. W., W. N. W.; strong gales, and very heavy squalls; cloudy. The sea runs very high.

May 10. Lat. ——; long. 74° 30′ W. (D. R.). Barometer, 29.10; temperature of air, 39°; of water, 41°. Winds: W. N. W., W. N. W., W. N. W.; heavy gales and clear, first part; snow and rain squalls, latter; occasionally a chance to make sail, but for very short periods.

May 11. Lat. ——; long. 75° 50′ W. (D. R.). Barometer, 29.10; temperature of air, 39°; of water, 41°. Winds: N. W., N. W., N. W.; heavy gales and rain; 7 P. M., violent squalls; middle, snow and rain; clear at intervals; ends strong gales and clear.

May 12. Lat. ——; long. 77° 05′ W. (D. R.). Barometer, 28.37; temperature of air, 42°; of water, 42°. Wind: variable throughout; moderate and cloudy; 10 A. M., barometer very low; made ready for a heavy gale; ends strong gale; hove to part of the day.

May 13. Lat. ——; long. 76° 45′ W. (D. R.). Barometer, 28.26; temperature of air, 35°; of water, 39°. Winds: N. W., N. W.; very heavy gales and squally; high sea.

May 14. Lat. 58° 22′ S.; long. 73° 00′ W. Barometer, 29.20; temperature of air, 41°; of water, 42°. Winds: S. W., W., W.; heavy gales and squally; rain and hail.

May 15. Lat. ——; long. 73° 22′ W. Barometer, 29.25; temperature of air, 42°; of water, 42°. Winds: W., W. N. W., W. N. W.; strong gales and squally.

May 16. Lat. 57° 27′ S.; long. 73° 44′ W. Barometer, 29.50; temperature of air, 37°; of water, 42°. Winds: N. W. by W., W. N. W., W. by S.; strong gales, rain and fog; middle, do. and rain; latter, moderate.

May 17. Lat.——; long. 75° 03′ W. Barometer, 29.40; temperature of air, 38°; of water, 41°. Winds: N. W., W. S. W., S. W.; strong winds and clear; latter part, strong gales and cloudy.

May 18. Lat. 56° 02′ S.; long. 74° 42′ W. Barometer, 29.70; temperature of air, 41°; of water, 43°. Winds: W. S. W., W. S. W., W. S. W.; strong gales and heavy squalls; middle, squally, hail and rain.

May 19. Lat. ——; long. 78° 08′ W. Barometer, 28.90; temperature of air, 42°; of water, 43°. Winds: W. S. W., N. N. E., N. E.; first, moderate and cloudy; middle, do.; ends, hard storm.

May 20. Lat. ——; long. 80° 18′ W. Barometer, 28.17; temperature of air, 46°; of water, 43°. Winds: N. E., N. N. W., N. N. W.; heavy gales and thick weather; lying to; shipped a sea, doing some slight damage; ends moderate and cloudy.

May 21. Lat. ——; long. 81° 21′ W. Barometer, 28.60; temperature of air, 43°; of water, 42°. Winds: N. W. by W., variable throughout; commences moderate and cloudy; barometer, low; often the barometer has indicated heavy weather when it was not experienced; *generally very correct.*

May 22. Lat. 53° 49′ S.; long. 81° 05′ W. Barometer, 29.50; temperature of air, 33°; of water, 41°. Winds: variable throughout; squally, with hail, rain, and snow.

May 23. Lat. ——; long. 82° 40′ W. Barometer, 29.60; temperature of air, 43°; of water, 42°; Winds: W. S. W., W., W.; first and middle parts, strong winds and squally; latter, strong gales and rainy.

May 24. Lat. 40° 10′ S.; long. 83° 00′ W. Current, N. E., about ½ knot. Barometer, 29.90; temperature of air, 46°; of water, 48°. Winds: W. S. W., W., W.; strong gales, and thick weather; midnight, rainy; latter, moderate.

Barque Parthian (Smith).

May 13, 1853. Lat. 50° 55′ S.; long. 63° 52′ W. Barometer, 29.1; temperature of air, 50°; of water, 48°. Winds: N. N. W., S. S. W. Fine weather; whole sail breeze.

May 14. Lat. 53° 17′ S.; long. 64° 38′ W. Barometer, 29.3; temperature of air, 47°; of water, 47°. Winds: W. S. W., W., W. S. W. Middle and latter parts, strong breeze and clear. Double reefs.

May 15. Barometer, 29.3; temperature of air, 46°. Wind: W. At 10 P. M. hove to for daylight, to pass through the Straits of Le Maire; at 9 A. M. entered, and at noon cleared the straits. Fine weather; all sail.

May 16. Lat. 56° 40′ S.; long. 67° 1′ W. Barometer, 29.2; temperature of air, 45°; of water, 43°. Winds: N. W., W., S. W. Middle part, strong breeze and rainy. Ends calm, with a heavy S. W. swell. At meridian, Cape Horn W. by N. 15 miles.

May 17. Lat. 57° 59′ S.; long. 68° 40′ W. Barometer, 28.7; temperature of air, 42°; of water, 43°. Winds: N., N. W., S. S. W. First and middle parts, moderate and rainy. Ends with a hard gale, with snow squalls.

May 18. Lat. 58° 21′ S.; long. ——. Barometer, 28.9; temperature of air, 40°; of water 41°. Winds: S. S. W., W., W. S. W. Throughout, a hard gale and squally.

May 19. Lat. 58° 51′ S.; long. ——. Barometer, 29.0; temperature, of air, 39°; of water, 40°. Winds: W. S. W. Latter part, moderate, inclining to calm.

May 20. Lat. 58° 32′ S.; long. ——. Barometer, 28.2; temperature of air, 44°; of water, 41°. Winds: N. E., N., N. N. W. Latter part, strong breeze and rainy. Double reefs.

May 21. Lat. 58° 45′ S.; long. 77° 10′ W. Barometer, 28.1; temperature of air, 44°; of water, 41°. Winds: N. N. W., N. W., W. N. W. Throughout at times rainy. Barometer, 28, lower than I have ever

seen it. At meridian, rising a little; since my last chronometer observations, the current, if any, very trifling to the N. E.

May 22. Lat. 57° 47′ S.; long. 78° 53′ W. Barometer, 28.0; temperature of air, 40°; of water 39°. Winds: N., variable, W. S. W. Moderate with much snow; middle part, wind went round the compass from W. to N. and E., and W.

May 23. Lat. 55° 50′ S.; long. ——. Barometer, 28.7; temperature of air, 40°; of water, 40°. Winds: W. S. W., W., W. by N. Latter part rainy; double reefs in the topsails.

May 24. Lat. 53° 40′ S.; long. ——. Barometer, 29.0; temperature of air, 46°; of water, 42°. Winds: W. S. W., S. W., W. S. W. Third and last parts, moderate and fine weather; all sail.

May 25. Lat. 53° 2′ S.; long. ——. Barometer, 28.5; temperature of air, 46°; of water, 43°. Winds: W. S. W., N. W., W. S. W. Third and last parts, blowing hard, with much rain, and heavy head sea; double reefs.

May. 26. Lat. 50° 40′ S.; long. 81° 25′ W. Barometer, 28.7; temperature of air, 47°; of water, 44°. Winds: S. W., S. W., W. S. W. Middle and latter parts, moderate; all sail.

Lantao (Geo. H. Bradbury.)

May 15, 1853. Lat. 51° 15′ S.; long. 68° 10′ W. Winds: N. N. W. to N. throughout. First part, moderate; middle, strong; and latter, fresh breezes. Bluff, at Santa Cruz, in sight, bearing W. N. W.; sea very smooth.

May 16. Lat. 53° 05′ S.; long. 56° 30′ W. Winds: N. to W. N. W. throughout. Moderate and cloudy; nasty swell from N. N. E.

May 17. Straits of Le Maire. Current, N. E., strong. Barometer, 29.37; Winds: W. N. W. to N. N. W., W. N. W., N. N. W. to S. W. First part, moderate and fine; middle, moderate and overcast; made Bell Mountain at 2 A. M., and soon after passed Cape St. Diego; was struck by a S. W. squall (in the middle of the straits), which settled into a heavy gale; ran back, and lay to under the lee of St. Diego.

May 18. Off Cape Good Success. Current, N. E., strong. Barometer, 29.80; temperature of air, 42°; of water, 45°. Winds: S. W., W., S. W. First part, strong gales and heavy squalls; middle, moderate; stood for the straits, and passed Cape Good Success at daylight; at noon it bore N. by W., distant 15 miles; the mountains covered with snow.

May 19. Lat. 56° 10′ S.; long. 66° 30′ W. Current, easterly, light. Barometer, 29.65; temperature of air, 41°; of water, 44°. Winds: W., W., and calm; calm, and N. E. to N. Strong gales and heavy squalls until midnight; then light to 4 A. M.; calm to 6 A. M.; breezed up from east, and round to north; at noon, fresh.

May 20. Lat. 56° 00′ S.; long. 71° 30′ W. Current, easterly, light. Barometer, 28.70; temperature of air, 46°; of water, 46°. Winds: N. N. E., N. N. E., N. Strong breezes and cloudy; ends rainy; at 4 P. M. Cape Horn N. by W., 15 miles; the land at 9 A. M., N. N. E.

May 21. Lat. 57° 00′ S.; long. 75° 30′ W. Barometer, 28.62; temperature of air, 43°. Winds: N. W. by N. throughout. Strong gales, with occasional lulls; little rain; squalls, not heavy.

May 22. Lat. 57° 40′ S.; long. 77° 00′ W. Barometer, 28.52; temperature of air, 35°; of water, 42°. Winds: N. N. W., N. W., W. Commences fresh and rainy, and threatening. At 3 P. M. a heavy squall, which lasted three hours and settled into a strong west gale; 6 A. M. moderating. Ends, strong breezes and squally.

May 23. Lat. 55° 00′ S.; long. ——. Barometer, 29.10; temperature of air, 42°; of water, 42°. Winds: W. S. W., W. by S., W. Strong breezes with heavy snow squalls.

May 24. Lat. 53° 25′ S.; long. 79° 00′ W. Barometer, 29.75; temperature of air, 41°; of water, 44°. Winds: W. to W. S. W. throughout. Fresh gales and rainy with heavy squalls. Ends fresh but moderating; snow and hail in the squalls.

May 25. Lat. 52° 25′ S.; long. 79° 45′ W. Barometer, 29.05; temperature of air, 45°. Winds: W. S. W., calm, W. to N. N. W., W. Fresh until 6 P. M., then calm; middle, strong gales and squally. Ends, do., with sleet, hail, &c.; heavy sea from southwest.

May 26. Lat. 49° 45′ S.; long. 79° 25′ W. Barometer, 29.25; temperature of air, 45°; of water, 48°. Wind: W. by N. to W. by S. throughout. Commences strong gales and hard squalls. Ends the same, but moderating; hail, snow, and rain in the squalls.

Competitor (Moses Hows).

May 18, 1853. Lat. 50° 58′ S.; long. 63′ 52′ W. Barometer, 29.90; temperature of air, 47°; of water, 46°. Winds: S. W. by S., S. S. W., and S. S. W. Strong head winds.

May 19. Lat. 54° 07′ S.; long. 63° 45′ W. Barometer, 29.70. (Broke the thermometer.) Winds: S. W., S. W., and N. W. First part, strong breezes; latter part, more moderate. At 4 A. M. wind hauled to the northwest; weather fine. At noon made Staten Land, S. S. E., 36 miles distant.

May 20. Lat. 56° 34′ S.; long. 68° 34′ W. Barometer, 29.50. Winds: N., N., and N. N. W. Begins fine breezes from the north. At 4 P. M. passes the east end of Staten Land, four miles distant. At 4 A. M. Cape Horn, north ten miles; during the night, squally with rain. Latter part, moderate; all sail set. Noon, Isle Diego N. W. one mile distant.

May 21. Lat. 57° 40′ S.; long. 72° 20′ W. Barometer, 29.10. Winds: N., N., and W. by N. Strong winds and squally, with rain.

May 22. Lat. 57° 36′ S.; long. 74° 20′ W. Barometer, 28.50. Winds: W. N. W., N., and W. S. W. A heavy sea and gale; shipping much water; washed off the eagle and split the stem; three feet water in the hold; worked the pumps till midnight. Ship making three inches water per hour.

May 23. Lat. 56° 08′ S.; long. 73° 50′ W. Barometer, 28.70; Winds: W., W. S. W., and W. S. W. Strong gales, heavy sea, and thick weather.

May 24. Lat. 56° 03′ S.; long. 75° 10′ W. Barometer, 29.30. Winds: W. S. W., S. W., and W. S. W. Strong gales; ship leaking three and a half inches per hour. Ends cloudy and heavy sea.

May 25. Lat. 55° 50′ S.; long. 76° 50′ W. Barometer, 28.50. Winds: S. W. by W., W. N. W., W. N. W. First part, strong breezes; latter part, moderate with rain.

May 26. Lat. 55° 48′ S.; long. 77° 50′ W. Barometer, 28.40. Winds: W., W. N. W., calm. A heavy swell. At daylight, put the ship before the wind; all hands employed strapping the bows together; put four parts of chain around through the hawse-pipes, and set it up with lashings over the bowsprit and across the stem. Ends with dark and gloomy weather.

May 27. Lat. 54° 58′ S.; long. 79° 40′ W. Barometer, 29.00. Winds: N., W. N. W., and N. E. Begins with light breezes from the northward; made all sail; fine weather.

May 28. Lat. 53° 18′ S.; long. 79° 30′ W. Barometer, 28.80. Winds: E., S. W., W. S. W. First part, light breezes; latter part, a gale.

May 29. Lat. 52° 12′ S.; long. 79° 45′ W. Barometer, 29.15. Winds: W. S. W., S. W., and S. W. Heavy gale and sea; middle part, more moderate; latter part, heavy squalls.

May 30. Lat. 51° 12′ S.; long. 79° 5′ W. Barometer, 27.02. Winds: S. W. by W., S. S. W., W. S. W. Violent gales.

May 31. Lat. 51° 14′ S.; long. 78° 30′ W. Barometer, 29.10. Winds: W. by S., W. S. W., W. S. W. Violent gales and a heavy sea.

June 1. Lat. 50° 42′ S.; long. 78° W. Barometer, 29.10. Winds: W. S. W., W. by S., W. S. W. Violent gales and heavy sea.

Golden Era (E. P. Sleeper).

June 3, 1853. Lat. 51° 48′ S.; long. 65° 31′ W. Barometer, 29.3; temperature of water, 44°. Winds: W. N. W. Moderate breezes. At 8 A. M. sounded; had 75 fathoms water.

June 4. Lat. 53° 05′ S.; long. 64° 49′ W. Barometer, 29.2; temperature of air, in the cabin, 51°; of water, 44°. Winds: W. S. W., W. S. W., variable, N. W., variable. Light breezes, and pleasant.

June 5. Lat. 54° 11′ S.; long. not observed. Cape St. John, Staten Land, bearing S. E. by S. Barometer, 29.00; temperature of air in the cabin, 48°; of water, 43°. Winds: W. N. W., N. W., N. W. to S. E. Light breezes. At daylight, Staten Land in sight; plenty of snow—very good place to slide down hill.

June 6. Lat. (D. R.) 54° 25′ S.; long. (D. R.) 63° 25′ W. Barometer, 29.00; temperature of air, 46°; of water, 42°. Winds: E., S. E. by S., S. E. by S. First part, light breezes; middle and latter, fresh breezes, and thick, with snow squalls.

June 7. Cape St. John bearing S. W. by S., 45 miles distant. Barometer, 29.30; temperature of air in the cabin, 42°; of water, 42°. Wind: S. Fresh gales and snow squalls all this day.

June 8. Lat. (D. R.) 55° 40′ S.; long. (D. R.) 62° 00′ W. Barometer, 28.9; temperature of air, 42°; of water, 40°. Winds: S., W., S. W. Fresh gales, with snow squalls.

June 9. Lat. (D. R.) 56° 09′ S.; long. 62° 07′ W. Barometer, 28.9; temperature of air in the cabin, 37°; of water, 39°. Winds: S. W., S. W., to S. S. W., S. E., variable. Fresh gales and snow squalls.

June 10. Lat. 56° 04′ S.; long. 62° 25′ W. Barometer, 29.3; temperature of air in the cabin, 34°; of water, 38°. Winds: S. E., S. E. to S. W., S. W. Fresh gales, with heavy squalls of snow and hail. Plenty of ice about deck.

June 11. Lat. (D. R.) 56° 51′ S.; long. (D. R.) 62° 03′ W. Barometer, 29.1; temperature of air, 32°; of water, 36°. Winds: S. W., S. W., variable, S. S. W. to S. The same as the last 24 hours.

June 12. Lat. (D. R.) 56° 17′ S.; long. (D. R.) 64° 12′ W. Barometer, 29.8; temperature of air, 31°; of water, 36°. Winds: S. S. E., S. E., S. S. E. to S. The same as the last 24 hours—darn'd unpleasant.

June 13. Lat. 55° 40′ S.; long. 64° 30′ W. Barometer, 29.8; temperature of air, 34°; of water, 35°. Winds: S. S. W., S. W. by S., S. W. by S. Fresh gales, with heavy squalls of snow and hail; a very bad sea.

June 14. Lat. 56° 16′ S.; long. 63° 45′ W. Barometer, 29.7; temperature of air, 36°; of water, 35°. Winds: S. S. W. to S. W., S. W. by S., S. S. W. Weather the same as yesterday.

June 15. Lat. (D. R.) 56° 09′ S.; long. (D. R.) 64° 40′ W. Barometer, 29.80; temperature of air, 43°; water, 37°. Winds: S. S. W. to S., S. to S. S. W., S. W. to W. Fresh gales and cloudy, with a very bad sea.

June 16. Lat. (D. R.) 57° 00′ S.; long. 64° 17′ W. Barometer, 29.5; temperature of air, 44°; water, 36°. Winds: W., W. by S., W. S. W. Heavy gale, thick and rainy.

June 17. Lat. (D. R.) 57° 44′ S.; long. (D. R.) 63° 43′ W. Barometer, 29.4; temperature of air, 45°; of water, 36°. Winds: W. S. W., W. S. W. Weather the same as yesterday.

June 18. Lat. (D. R.) 58° 28′ S.; long. (D. R.) 63° 16′ W. Barometer, 29.4; temperature of air, 45°; of water, 37°. Winds: S. W., W. S. W., W. by S. Heavy gale, thick and rainy weather; very bad sea.

June 19. Lat. 57° 33′ (D. R.) S.; long. (D. R.) 63° 40′ W. Barometer, 29.20; temperature of air, 42°; of water, 40°. Winds: W. by S., W. N. W., W. to S. Weather the same as yesterday.

June 20. Lat. (D. R.) 57° 48′ S.; long. (D. R.) 63° 48′ W. Barometer, 29.1; temperature of air, 43°; of water, 36°. Winds: S. E. to N. E., N. E. to N. W., N. W. by N. First part, very light breezes; latter part, fresh, thick, and rainy; very bad sea.

June 21. Lat. (D. R.) 58° 39′ S.; long. (D. R.) 64° 30′ W. Barometer, 28.7; temperature of air, 38°: of water, 32°. Winds: S. W. variable, W. N. W., W. by N. variable. First and middle parts, fresh breezes; latter, fresh gale, with snow.

June 22. Lat. (D. R.) 59° 27′ S.; long. (D. R.) 64° 30′ W. Barometer, 28.7; temperature of air, 25°; of water, 29°. Winds: W. S. W., W., variable, W. to S. W. Fresh gale, and light breezes; very heavy squalls of snow and hail throughout.

June 23. Lat. (D. R.) 59° 47° S.; long. (D. R.) 64° 30′ W. Barometer, 29.00; temperature of air, 16°; of water, 28°. Winds: W. to S. W., W. N. W., calm. First part, fresh gale; at 2 A. M., calm; at daylight the whole ocean was one sheet of ice, or slush, from about six to ten inches in thickness; no water to be seen; ends with fresh breezes; snow throughout.

June 24. Lat. (D. R.) 59° 00′ S.; long. (D. R.) 69° 15′ W. Barometer, 29.2; temperature of air, 20°;

of water, 36°. Winds: E., E. by S., S. E., variable. Fresh gales, with a regular "down east" snow storm. At 3 P. M., run out of the ice. For the last three days the vessel has been covered in ice, being from one to two feet thick on the outside.

June 25. Lat. (D. R.) 58° 47′ S.; long. (D. R.) 71° 34′ W. Barometer, 29.2; temperature of air, 27°; of water, 36°. Winds: S. E., S. E. variable, S. E. Light breezes and calms; moderate snow squalls.

June. 26. Lat. (D. R.) 57° 30′ S.; long. (D. R.) 74° 21′ W. Barometer, 29.6; temperature of air, 37°; of water, 39°. Winds: S., S. by W., S. to W. S. W. First part, light breezes; middle and latter, moderate breezes, thick and rainy.

June 27. Lat. 56° 12′ S.; long. 76° 00′ W. Barometer, 29.7; temperature of air, 39°; of water, 40°. Winds: S. S. W. to S. W., S. S. W., S. W. by S. First part, moderate breezes, with light snow squalls; latter part, quite pleasant for Cape Horn; but if I was in any other part of the world, I should call it unpleasant.

June 28. Lat. 55° 26′ S.; long. 78° 24′ W. Barometer, 29.50; temperature of air, 39°; of water, 40°. Winds: S. S. W., S. S. W., calm. Moderate breezes and quite pleasant.

June 29. Lat. 53° 35′ S.; long. 79° 18′ W. Barometer, 29.50; temperature of air, 38°; of water, 41°. Winds: S. W., W. S. W., S. W. to W. Light breezes throughout.

June 30. Lat. (D. R.) 52° 45′ S.; long. (D. R.) 79° 30′ W. Barometer, 29.1; temperature of air, 39°; of water, 41°. Winds: W., W. to W. N. W., W. by N. First part, fresh breezes. Ends a heavy gale, with squalls of hail.

July 1. Lat. 50° 49′ S.; long. 79° 55′ W. Current, E., 40 miles during the last 24 hours. Barometer, 29.4; temperature of air, 39°; of water, 42°. Winds: S. W. by S., S. W., S. W. by W. Fresh gales with very heavy sea. Squalls of hail and snow.

Ship White Squall (S. Kennedy), New York to San Francisco.

May 28, 1853. Lat. 50° 7′ S.; long. 63° 37′ W. Barometer, 29.40; temperature of air, 48°; of water, 48°. Winds: W., N. W., N. Moderate all day; cloudy weather.

May 29. Lat. 52° 6′ N.; long. 63° 32′ W. Barometer, 28.80; temperature of air, 44°; of water, 44°. Winds: N., N. W., S. Moderate; very gloomy.

May 30. Lat. 52° 31′ S.; long. 63° 18′ W. Barometer, 28.30; temperature of air, 48°; of water, 46°. Winds: S., calm, baffling. Begins calm; ends N. E. gale.

May 31. Lat. 54° 30′ S.; long. 63° 31′ W. Barometer, 28.90; temperature of air, 40°; of water, 38°. Winds: calm, E., N. E. Strong gale until 4 A. M., when it hauled to the S. W. and cleared up.

June 1. Lat. 56° 32′ S.; long. 65° 2′ W. Barometer, 29.80; temperature of air, 38°; of water, 38°. Winds: N. E., N. E., S. W. The same low barometer until 2 A. M., then rises, and the wind hauls N. E.; moderate.

June 2. Lat. 56° 45′ S.; long. 66° 28′ W. Barometer, 29.30; temperature of air, 34°; of water, 36°.

Winds: W., S. W., calm, and N. E. Begins fresh breezes N. E.; at 10 P. M., N. W. Ends a gale at west, and snow.

June 3. Lat. 57° 34′ S.; long. 68° 43′ W. Barometer, 29.90; temperature of air, 32°; of water, 34°. Winds: N. E., N. W., W. S. W. Commences a gale at W. S. W. Ends more moderate.

June 4. Lat. 57° 47′ S.; long. 68° 47′ W. Current, E. N. E., 27 knots per day. Barometer, 29.95; temperature of air, 33°; of water, 37°. Winds: S. W., W., W. Commences a moderate gale; ends a moderate breeze. Saw Diego Ramirez, bearing N. W. by N.

June 5. Lat. 56° 46′ S.; long. 68° 54′ W. Current, E., 35 knots per day. Barometer, 29.70; temperature of air, 34°; of water, 42°. Winds: W., N. W., S. E. Strong breezes and passing snow squalls all day.

June 6. Lat. 55° 47′ S.; long. 75° 30′ W. Current, E. S. E., 15 knots per day. Barometer, 29.70; temperature of air, 28°; of water 41°. Winds: S. S. E. throughout. Fine breezes all day; saw Aurora Australis.

June 7. Lat. 52° 49′ S.; long. 78° 57′ W. Current, S. E., 25 knots per day. Barometer, 30.10; temperature of air, 32°; of water, 43°. Winds: S. S. E., S., S. W. Cloudy weather all day. Moderate breeze.

June 8. Lat. 49° 12′ S.; long. 77° 46′ W. Current, E., 10 knots per day. Barometer, 30.15; temperature of air, 36°; of water, 45°. Winds: W., N. W., N. W. Nearly calm all day.

Ship Victory (O. G. Lane), New York to San Francisco, 55 days out.

June 15, 1853. Lat. 51° 03′ S.; long. 56° 49′ W. Barometer, 28.60; temperature of air, 44°; of water, 42°. Winds: N. N. W., N. W., W. S. W. First part, heavy gales and hazy; second part, fresh breezes; third part, at times calm, and fine breezes with mist and rain.

June 16. Lat. 52° 12′ S.; long. 56° 20′ W. Barometer, 28.90; temperature of air, 31°; of water, 42°. Winds: W. S. W., S. W. by W., S. W. by W. First part, fresh and rainy; second part, hard gales, and heavy snow squalls; third part, heavy gales and thick snow squalls.

June 17. Lat. 52° 13′ S.; long. 55° 50′ W. Current, E. N. E., 1½ knots per hour. Barometer, 29.45; temperature of air, 32°; of water, 41°. Winds: S. W., S. W., S. W. Strong breezes with snow squalls.

June 18. Lat. 52° 54′ S.; long. 54° 38′ W. Current, N. E. by E., 1 mile per hour. Barometer, 29.62; temperature of air, 37°; of water, 40°. Winds: S. W., S. S. W., S. S. W. Fresh breezes with snow squalls.

June 19. Lat. 53° 40′ S.; long. 57° 00′ W. Barometer, 29.40; temperature of air, 40°; of water, 41°. Winds: S. S. W., N. W., N. W. by W. First and second parts, fresh breezes; third part, gale.

June 20. Lat. 54° 30′ S.; long. 60° 46′ W. Barometer, 28.85; temperature of air, 42°; of water, 42°. Winds: N. W. by W., W. N. W., N. W. First part, strong gale and cloudy; second and third parts, fresh and cloudy.

June 21. Lat. 55° 05′ S.; long. 63° 43′ W. Current. E. N. E. ½ knot. Barometer, 28.60; tempera-

ture of air, 42°; of water, 41°. Winds: N. W. by W., W. N. W., N. N. W. First part, moderate, cloudy, and misty; second part, moderate and foggy; third part, light and pleasant.

June 22. Lat. 56° 20′ S.; long. 66° 30′ W. Current, 1½ knot, N. N. E. Barometer, 28.30; temperature of air, 42°; of water, 41°. Winds: N. N. W., N. N. E., E. First and second parts, moderate and cloudy; third part, light breezes and rain.

June 23. Lat. 56° 40′ S.; long. 66° 50′ W. Current, 1 knot, N. E. by N. Barometer, 28.40; temperature of air, 42°; of water, 42°. Winds: S., calm, S. W. First part, light airs; second part, calm; third part, fresh breezes and cloudy misty weather.

June 24. Lat. 57° 33′ S.; long. 68° 20′ W. Barometer, 28.70; temperature of air, 40°; of water, 40°. Winds: S. W., calm, N. N. W. First part, fresh; second part, calm; third part, light airs and calm at times.

June 25. Lat. 57° 35′ S.; long. 71° 20′ W. Barometer, 28.07; temperature of air, 37°; of water, 39°. Winds: N. N. W., N. W., N. W. First part, fresh; second and third parts, strong gales and stronger snow squalls, rain, and hail.

June 26. Lat. 57° 20′ S.; long. 71° 30′ W. Barometer, 29.60; temperature of air, 37°; of water, 39°. Winds: N. W., W., W. S. W. Heavy gales and hard snow squalls.

June 27. Lat. 56° 39′ S.; long. 71° 33′ W. Barometer, 28.95; temperature of air, 39°; of water, 41°. Winds: W. S. W., W. S. W., W. First part, strong gales and squalls; second and third parts, moderate.

June 28. Lat. 56° 26′ S.; long. 75° 29′ W. Barometer, 28.80; temperature of air, 40°; of water, 41°. Winds: calm, N. W., N. W. First part, calm; second part, light breezes; third part, moderate and cloudy.

June 29. Lat. 55° 29′ S.; long. 75° 23′ W. Current, E., 1 knot. Barometer, 28.80; temperature of air, 39°; of water, 41°. Winds: N. W., W. S. W., S. E. First and second parts, moderate and cloudy; third part, light airs and pleasant.

June 30. Lat. 53° 30′ S.; long. 79° 03′ W. Barometer, 29.05; temperature of air, 39°; of water, 42°. Winds: E., S. E., S. S. E. First part, moderate; second and third parts, fresh breezes with snow squalls.

July 1. Lat. 51° 04′ S.; long. 82° 16′ W. Barometer, 29.50; temperature of air, 39°; of water, 43°. Winds: S. S. E., S. S. W., S. W. First part, fresh breezes and cloudy; second part, moderate with light snow squalls; third part, moderate with light snow squalls.

July 2. Lat. 49° 14′ S.; long. 84° 32′ W. Barometer, 30.00; temperature of air, 40°; of water, 44°. Winds: S. S. W., S. S. E., calm. First part, moderate, snow squalls; second part, light breezes and cloudy; third part, baffling airs and calms.

Schooner L. P. Foster (J. P. Keller), Boston to Puget Sound, 70 days out.

June 8, 1853. Lat. 49° 16′ S.; long. 66° 38′ W. Barometer, 30.20; temperature of air, 41°; of water,

46°. Winds: W., calm, N. W. Fine fair day; noon, 50 fathoms water. First and latter parts, light breezes; middle, calm. At 4 P. M. land about Port Julien in sight, bearing W. N. W., true, about 30 miles.

June 9. Lat. 50° 42′ S.; long. 67° 15′ W. Var. obs. 18° 30′ E. Barometer, 30; temperature of air, 42°; of water, 45°. Winds: N. W., variable, S. W. by S. Commences with a decreasing breeze; middle, light, calm, and variable, from N. W. to S. S. W.; day only 8 hours long; weather fine; ends with a fresh breeze, dying away.

June 10. Lat. 51° 34′ S.; long. 67° 20′ W. Barometer, 30.05; temperature of air, 41°; of water, 44°. Winds: S., N. W., N. W. Fine weather. At 5 A. M., sudden fall of wind, and veering westward; 9 A. M., calm; noon, light breeze; dark green and smooth sea; at noon, off the Straits of Magellan.

June 11. Lat. 53° 45′ S. (D. R.); long. 66° 54′ W. (D. R.). Barometer, 29.55. Winds: N. W., N. N. W., N. W. First part, gentle breezes, with dark flying clouds, probably fog; as daylight came on, the sky became obscured by this vapor. At 9 A. M., barometer falling; land in sight about Cape Pinas; noon, quite thick and dark; barometer, 29.35; lower than I have noticed it before; no change in the weather, except the fog. Thus far I have made no remarks upon the barometer. If I should dare to hazard an opinion, would say that, with the wind at N. E. and E., north of the equator, it ranges highest; and with southerly winds south of it, and particularly south of Capricorn, lowest; or, at least, that southerly winds may be expected when low, and westerly and northwesterly when quite high; though we have had our strongest wind (even a terrific gale for a few hours) after the barometer had fallen to 29.40 some two hours and stopped. I think it was rising at the time; wind from about west, perhaps a little northerly and inclining southward. Running along the land; wind veering north; saw what looked like snow on the mountain tops; at 10 P. M., up with Cape Diego, in sight; at the end of the day in the straits; weather getting fair; wind strong at N. W.

June 12. Straits of Le Maire. Barometer, 30.20; temperature of air, 41°; of water, 46°. Winds: W. N. W., S. S. W., W. N. W. At 2 A. M., well through the straits; wind now strong, having just had doldrums and an agitated sea; sea probably effect of currents; doldrums, of high lands. At 4 A. M., wind increasing; 7 hours 30 min. A. M., wind S. S. W., wore to the westward; hail showers. At 10 A. M., bore up for straits; strong gale and snow squalls; rough sea; moderating towards the latter part; at end standing back; strong N. E. current.

June 13. Off west end of Staten Land. Current, N. N. E. Barometer, 30.05; temperature of air, 39°; of water, 42°. Winds: W., W. N. W., N. W. Strong breezes and fresh gales. At noon, standing through the straits again; wind veering northward; barometer, 8 A. M., 29.50. At 4 P. M., Cape Good Success W. N. W. 6 miles; wind N. W., and increasing; 10, moderating; barometer falling. At midnight, quite moderate and overcast.

June 14. Cape Horn, N. W., 20 miles. Barometer, 29.20; temperature of air, 38°; of water, 41°. Winds: N., S., S. S. W. At 4 A. M., kept up for the cape; heavy westerly swell. At 8 A. M., cape, snow

covered, W. N. W. 20 miles; wind light. At noon, calm, dark, and cloudy. At 1 P. M., rainy; wind south; barometer, 28.90; ends with an unsteady breeze and snow squalls.

June 15. S. W. part Hermit Island N. W. 8 miles. Barometer, 29.20; temperature of air, 32°; of water, 42°. Winds: S. W., S. S. W., S. First and middle part, strong breezes; snow squalls throughout. Barometer, at noon, 29.70.

June 16. Diego Ramirez, W. 10 miles. Barometer, 29.70; temperature of air, 32°; of water, 42°. Winds: S. S. E., S. E., S. At 8 A. M., Cape Horn N. W. 12 miles; ice and snow on deck, cloudy; 6 P. M., nearly calm; at 9 P. M., wind strong, with snow squalls, which last throughout.

June 17. Lat. 55° 45′ S. (D. R.); long. 69° 35′ W. (D. R.). Barometer, 30.30; temperature of air, 38°; of water, 42°. Winds: S., S. W., W. S. W.; fresh breezes, with snow and rain. At 8 A. M., Isle Ildefonso N. E. by N. 10 miles; at 4 P. M. near the west end of Hoste Island—rough, rugged, snow-covered, fire-rent hills and mountains. Barometer, at sunset, 30.70.

June 18. Lat. 56° 05′ S. (D. R.); long. 69° 45′ W. (D. R.). Barometer, 30.40; temperature of air, 38°; of water, 42°. Winds: W. N. W., N. W. by N., N. N. W.; strong and increasing gales, with occasional rain.

June 19. Lat. 56° 19′ S. (D. R.); long. 72° 52′ W. (D. R.). Barometer, 29.70; temperature of air, 40°. Winds: N. W., N. W., N. W. to W.; fresh gales, with rain squalls. Ends, strong gales. No current noticed since leaving the straits.

June 20. Lat. 56° 41′ S. (D. R.); long. 73° 32′ W. (D. R.). Barometer, 29.40; temperature of air, 39°; of water, 40°. Winds: W. N. W., N. W. by W., N. W. Commences fresh breezes, and rainy; middle, strong; latter, cloudy; 6 P. M. barometer 29.00; moderating.

June 21. Lat. 58° 21′ S.; long. 74° 35′ W. (D. R.). Barometer, 28.95; temperature of air, 39°; of water, 40°. Showery during the forenoon; wind rising. Ends, fresh breezes and rainy; sea rough: there may be some current with the wind, as an indifferent observation differs one degree from account.

June 22. Lat. 57° 50′ S.; long. 79° 13′ W. Barometer, 28.90; temperature of air, 40°; of water, 39°. Winds: N. N. W., N. N. W., N.; cloudy and rainy at intervals; latter part, wind light. Barometer, lower than it has been at any time before.

June 23. Lat. 57° 49 S.; long. 81° 00′ W. Barometer, 28.90; temperature of air, 38°; of water, 39°. Winds: W. N. W., N. W., N. N. E.; cloudy and rainy at times. First and middle parts, light to moderate; latter, fresh and squally, with snow. Wind veered to N. W. at end of day.

June 24. Lat. 57° 09′ S.; (D. R.); long. 82° 30′ W. (D. R.). Winds: N. W. by N., N. N. E., S. First part, moderate; middle, strong, with snow squalls. Weather, broken; from 2 to 8 P. M. calm; at that time a strong southerly wind. Barometer, 28.60, and commenced rising. Ends with snow squalls.

June 25. Lat. 55° 00′ S.; long. 83° 28′ W. Barometer, 29.00; temperature of air, 36°; of water, 40°. Winds: S., S., W. N. W. First, strong gales from south; middle, decreasing; latter, varying between S. W. by W., and W. N. W., with occasional snow squalls.

June 26. Lat. 53° 15′ S.; long. 82° 50′ W. Barometer, 29.40; temperature of air, 38°; of water 41°.

Winds: N. W., W. S. W., N. N. W.; wind strong at times, and varying from W. S. W. to N. W., with some rain and snow.

June 27. Lat. 52° 45′ S. (D. R.); long. 83° 41′ W. (D. R.). Barometer, 29.50; temperature of air, 37°; of water, 41°. Winds: N., N., N. N. W.; unsteady winds, with hail and snow; now a storm, and then a calm. Ends very heavy squalls, but altogether moderating.

June 28. Lat. 52° 25′ S.; long. 85° 21′ W. Barometer, 29.30; temperature of air, 40°; of water, 41°. Winds: N., calm, S. E.; at 4 A. M. calm; decks coated with ice. First part, light winds; middle and latter, calm and increasing S. E. breezes. Barometer up and down $\frac{3}{10}$. Ends rainy.

June 29. Lat. 50° 28′ S.; long. 85° 11′ W. Barometer, 29.50; temperature of air, 38°; of water, 42°. Winds: E. S. E., S. E., S. S. E. First half, increasing breeze, drizzly, rain; latter strong, inclining southerly; occasional hail squalls.

Ship John Land (Peleg Howes), Boston to San Francisco, 53 days out.

June 14. Lat. 50° 39′ S.; long. 64° 02′ W. Barometer, 28.8; temperature of air, 46°; of water, 44°. Winds: N. W., N. W., N. W. Heavy gales.

June 15. Lat. 53° 03′ S.; long. 62° 50′ W. Barometer, 28.9; temperature of air, 46°; of water, 44°. Winds: W. N. W., S. W., S. W. First, heavy gales; second, hail and snow; third, squally.

June 16. Lat. 53° 50′ S.; long. 61° 53′ W. Current, E. N. E., 1 knot per hour. Barometer, 29.2; temperature of air, 39°; of water, 40°. Winds: S. W., S. S.W., S. S. W. Strong gales.

June 17. Lat. 54° 20′ S.; long. 63° 35′ W. Current, E. by N., ½ knot per hour. Barometer, 28.8; temperature of air, 39°; of water, 40°. Winds: S. S. W., S., S. S. W. Heavy squalls.

June 18. Lat. 54° 27′ S.; long. 62° 01′ W. Current, E. by N., ½ knot per hour. Barometer, 29.2; temperature of air, 30°; of water, 42°. Winds: S. S. W., S. S. W., S. W. by S. Strong winds.

June 19. Lat. 56° 24′ S.; long. 65° 20′ W. Current, E. by N., ½ knot per hour. Barometer, 29.2; temperature of air, 30°; of water, 42°. Winds: W. S. W., W. S. W., W. by S. Heavy snow squalls and sleet.

June 20. Lat. 57° 24′ S.; long. 67° 17′ W. Current, E. by N., ½ knot per hour. Barometer, 28.8; temperature of air, 30° of water, 42°. Winds: W. by S., W. by S., W. N. W. Strong gales.

June 21. Lat. 58° 12′ S.; long. 70° 27′ W. Current, E. by N., 20 miles. Barometer, 28.6; Winds: N. W. by N., N. W. by N., N. W. by N. Heavy gales.

June 22. Lat. 57° 26′ S.; long. 75° 10′ W. Current, E. by N., 20 miles. Barometer, 28.5; temperature of air, 30°; of water, 42°. Winds: N. W., N. W., N. W. Strong gales, with passing squalls, with snow.

June 23. Lat. 57° 24′ S.; long. 79° 04′ W. Current, E. by N., 20 miles. Barometer, 28.6; temperature of air, 30°; of water, 42°. Winds: N. W. by N. throughout. Heavy weather.

June 24. Lat. 56° 27′ S.; long. 80° 33′ W. Current, E. by N., 20 miles. Barometer, 28.2; temperature of air, 30°; of water, 42°. Winds: W. S. W., W. S. W., N. W. by W. Fresh breezes.

June 25. Lat. 55° 17′ S.; long. 80° 33′ W. Current, east, 1 knot per hour. Barometer, 28.2; temperature of air, 30°; of water, 42°. Winds: W. S. W. throughout. Heavy gales.

June 26. Lat. 53° 20′ S.; long. 80° 10′ W. Current, east, 1 knot per hour. Barometer, 28.25; temperature of air, 30°; of water, 42°. Winds: W. by N., W. N. W., N. W. by W. Heavy gales; snow and hail.

June 27. Lat. 52° 36′ S.; long. 80° 35′ W. Current, east, 14 miles. Barometer, 28.9; temperature of air, 30°; of water, 42°. Winds: N. W., N. W., N. W. by W. First part, fresh winds; latter, strong winds, and squally.

June 28. Lat. 52° 10′ S.; long. 83° 32′ W. Current, E. by N., 14 miles. Barometer, 28.8. Winds: N. W., N. W., N. W. by W. Strong breezes, and squally.

June 29. Lat. 50° 32′ S.; long. 85° 13′ W. Current, E. N. E., 15 miles. Barometer, 28.9. Winds: N., N. E., S. E. by E. Moderate breezes, and cloudy.

Barque Ellen Noyes (F. A. Lewis), Boston to San Francisco, 75 days out.

July 1. Lat. 50° 46′ S.; long. 54° 20′ W. Barometer, 29.1; temperature of air, 40°. Winds: W. S. W. throughout. Strong gales, and clear.

July 2. Lat. 52° 00′ S.; long. 55° 01′ W. Barometer, 29.0. Winds: W. S. W., W., W. N. W. Fresh gales, and cloudy.

July 3. Lat. 53° 26′ S.; long. 56° 50′ W. Barometer, 28.9. Winds: N. W., N. W., W. S. W. Gales, and cloudy.

July 4. Lat. 54° 40′ S.; long. 57° 57′ W. Barometer, 28.4. Winds: N. W., variable, variable. Gales and squally, with snow.

July 5. Lat. 54° 44′ S.; long. 58° 00′ W. Barometer, 29.0; temperature of air, 25°; of water, 38°. Winds: variable throughout. Heavy snow squalls.

July 6. Lat. 55° 20′ S.; long. 57° 00′ W. Barometer, 29.0; temperature of air, 25°; of water, 38°. Winds: variable throughout. Snow squalls.

July 7. Lat. 55° 15′ S.; long. 59° 00′ W. Barometer, 29.3; temperature of air, 28°; of water, 37°. Winds: variable throughout. Snow squalls.

July 8. Lat. 55° 20′ S.; long. 61° 20′ W. Barometer, 29.14; temperature of air, 29°. Winds: variable from E. to S. S. W., with snow squalls.

July 9. Lat. 54° 51′ S.; long. 62° 15′ W. Barometer, 29.6; temperature of air, 29°. Winds: varying from E. to S. S. W., with snow squalls.

July 10. Lat. 54° 48′ S.; long. 62° 40′ W. Barometer, 29.6; temperature of air, 30°. Winds: variable throughout. Light winds, and clear.

July 11. Lat. 56° 08′ S.; long. 64° 20′ W. Barometer, 29.4; temperature of air, 30°. Winds: variable throughout. Strong N. E. gales, and cloudy.

July 12. Lat. 58° 01′ S.; long. 71° 51′ W. Barometer, 29.6; temperature of air, 32°. Winds: N. E., N. E., N. W. Strong gales and squally.

July 13. Lat. 57° 48′ S.; long. 70° 40′ W. Barometer, 29.6. Winds: W. S. W., W. S. W., S. W. by W. Strong gales and squally.

July 14. Lat. 58° 25′ S.; long. 72° 06′ W. Barometer, 29.6. Winds: variable throughout. Light winds and pleasant.

July 15. Lat. 58° 17′ S.; long. 72° 46′ W. Barometer, 29.6; temperature of air, 33°. Winds: variable, calm, calm, light and baffling; second and third, calm.

July 16. Lat. 57° 55′ S.; long. 74° 21′ W. Barometer, 29.6; temperature of air, 33°. Winds: variable throughout. Light airs. Current, E., one knot per hour.

July 17. Lat. 57° 50′ S.; long. 74° 15′ W. Barometer, 29.4; temperature of air, 35°. Winds: calm, calm, S. W. First and second, calm; third, fresh and squally. Current, E., one knot per hour.

July 18. Lat. 56° 04′ S.; long. 76° 15′ W. Barometer, 29.4; temperature of air, 32°. Winds: N. W., W., W. Fresh breezes and squally.

July 19. Lat. 53° 28′ S.; long. 78° 30′ W. Barometer, 29.7; temperature of air, 35°. Winds: W., S. W., S. S. W. Fresh breezes and squally.

July 20. Lat. 52° 01′ S.; long. 78° 34′ W. Barometer, 30; temperature of air, 35°. Winds: S. throughout. Light winds and foggy.

July 21. Lat. 50° 02′ S.; long. 78° 41′ W. Barometer, 30. Winds: S., S. E., N. E. Strong winds and foggy, with light rain.

Ship White Squall (Samuel Kennedy), Philadelphia to San Francisco, 57 days out.

July 5, 1852. Lat. 50° 21′ S.; long. 63° 55′ W. Current, N. N. E., 30 miles. Barometer, 29.00; temperature of air, 42°; of water, 41°. Winds: N. W., N. N. E., N. Cloudy, with rain.

July 6. Lat. 51° 32′ S.; long. 64° 35′ W. Current, N. E., 30 miles. Barometer, 29.64; temperature of air, 40°; of water, 40°. Winds: N. E., N. W., N. E. Moderate and cloudy.

July 7. Lat. 54° 25′ S.; long. 63° 00′ W. Barometer, 29.40; temperature of air, 39°; of water, 39°. Winds: N. E., N. E., E. N. E. Moderate and cloudy.

July 8. Lat. 55° 24′ S.; long. 63° 19′ W. Barometer, 29.40; temperature of air, 32°; of water, 36°. Winds: baffling from N. E. to E. S. E. Cloudy, with snow and rain; calm at times.

July 9. Lat. 55° 50′ S.; long. 65° 00′ W. Barometer, 29.55; temperature of air, 33°; of water, 37°. Winds: E. N. E., E. N. E., N.; nearly calm all day; snow, hail, and rain.

July 10. Lat. 56° 00′ S.; long. 66° 30′ W. Barometer, 29.78; temperature of air, 36°; of water, 38°. Winds: calm throughout. Thick fog. 4 days current, N. E., 101 miles.

July 11. Lat. 56° 40′ S.; long. 67° 40′ W. Current, E. N. E., 31 miles. Barometer, 29.53; temperature of air, 36°; of water, 38°. Winds: calm, N., N. W. At times, calm and fog.

July 12. Lat. 58° 17′ S.; long. 70° 19′ W. Current, E. by S., 41 miles. Barometer, 29.60; temperature of air, 35°; of water, 41°. Winds: N. W., W., W. Squally, hail, and rain.

July 13. Lat. 58° 42′ S.; long. 72° 32′ W. Barometer, 29.26; temperature of air, 30°; of water, 40°. Winds: N. W. to N. N. W., N. W. to S. W., calm. First and second parts, heavy squalls; third, calm.

July 14. Lat. 57° 59′ S.; long. 75° 53′ W. 2 days current, E. by N., 92 miles. Barometer, 29.21; temperature of air, 29°; of water, 35°. Winds: calm, E., E. N. E. First, calm; second and third, moderate and snow.

July 15. Lat. 55° 37′ S.; long. 78° 32′ W. Current, N. E., 32 miles. Barometer, 29.46; temperature of air, 25°; of water, 32°. Winds: S. S. E., S., S. Moderate; latter, stormy.

July 16. Lat. 54° 07′ S.; long. 80° 33′ W. Current, E. S. E., 35 miles. Barometer, 29.17; temperature of air, 38° of water, 39°. Winds: S. S. E., N., S. W. First part, strong breezes and fine weather; second part, blowing fresh; third part, calm and cloudy.

July 17. Lat. 53° 33′ S.; long. 80° 10′ W. Current, E., 27 miles. Barometer, 29.08; temperature of air, 35°; of water, 35°. Winds: S. W., N. N. W., N. W. Hard gales.

July 18. Lat. 52° 35′ S.; long. 78° 57′ W. Current, S. E., 24 miles. Barometer, 28.93; temperature of air, 37°; of water, 38°. Winds: W., W. S. W., W. S. W. Fresh gales throughout.

July 19. Lat. 53° 18′ S.; long. 79° 20′ W. Barometer, 28.97; temperature of air, 37°; of water, 39°. Winds: W., W. N. W., N. W. Heavy gales and squally.

July 20. Lat. 54° 10′ S.; long. 78° 33′ W. Current, E. S. E., 36 miles. Barometer, 29.06; temperature of air, 38°; of water, 41°. Winds: N. W., W. N. W., N. W. Heavy gales; lightning, hail, and rain.

July 21. Lat. 53° 32′ S.; long. 79° 19′ W. Current, S. E., 42 miles. Barometer, 29.28; temperature of air, 36°; of water, 40°. Winds: W., calm, E. First, gale; middle, calm; latter, blowing hard, snow, hail, and rain.

July 22. Lat. 51° 28′ S.; long. 81° 45′ W. Barometer, 28.87; temperature of air, 38°; of water, 42°. Winds: E., S., S. W. First, heavy gales; second, tremendous gales; third part, moderate.

July 23. Lat. 48° 51′ S.; long. 79° 52′. W. Current, S. S. E., 41 miles. Barometer, 29.60; temperature of air, 38°; of water, 13°. Winds: W. N. W., W., S. W.; moderate and pleasant.

N. B. Palmer (C. P. Low), 49 days out.

July 10, 1852. Lat. 48° 47′ S.; long. 57° 52′ W. Barometer, 29.90. Winds: S. W. by W., W. N. W., S. S. W. Light airs, and variable, with much snow.

July 11. Lat. 51° 54′ S.; long. 55° 43′ W. Barometer, 29.8. Winds: S., W. S. W., W. N. W. Stiff breezes, and cloudy.

July 12. Lat. 53° 23′ S.; long. 55° 04′ W. Barometer, 29.2. Winds: W. S. W. Stiff breezes and cloudy, hazy weather.

July 13. Lat. 54° 42′ S.; long. 56° 02′ W. Barometer, 28.8. Winds: N. N. W., W. S. W., W. S. W. First part, moderate top-gallant breeze; middle and latter, gales, with heavy sea.

July 14. Lat. 55° 02′ S.; long. 56° 51′ W. Barometer, 29.4. Winds: S. W., S. W. by W., S. Heavy gales.

July 15. Lat. 54° 31′ S.; long. 61° 12′ W. Barometer, 28.8. Winds: S., W. N. W., N. W. Double-reefed topsails, and reefed courses; heavy sea.

July 16. Lat. 54° 40′ S.; long. 62° 56′ W. Barometer, 28.8. Winds: N. N. W., N. N. W., S. W. by W. First part, moderate breezes. At 10 A. M., made Staten Land, bearing S. S. W., distant 20 miles. Ends strong gales.

July 17. Lat. 56° 41′ S.; long. 66° 00′ W. Barometer, 29.6. Wind: W. S. W. First part, under close reefs; ends under double reefs.

July 18. Lat. 56° 35′ S.; long. 68° 00′ W. Barometer, 29.2. Winds: W. N. W., N. N. E., N. N. E. Under double reefs; Cape Horn bearing north, by compass, 36 miles distant.

July 19. Lat. 57° 18′ S.; long. 69° 30′ W. Barometer, 29.6. Winds: W. N. W., W. by N., W. First part, heavy gales, with heavy sea; middle, close reefs; latter, single reefs.

July 20. Lat. 57° 40′ S.; long. 72° 32′ W. Barometer, 29.6. Winds: S. S. E., S., S. S. W. Single reefs, with top-gallant sails.

July 21. Lat. 56° 21′ S.; long. 73° 47′ W. Barometer, 28.5. Winds: S. S. E., S. S. W., S. S. W. First part, very heavy snow squalls from the south; middle and latter, close reefs.

July 22. Lat. 55° 20′ S.; long. 77° 30′ W. Barometer, 29.2. Winds: N. E., N., N. W. First, moderate breezes and cloudy; ends double reefed topsail breeze.

July 23. Lat. 54° 44′ S.; long. 78° 04′ W. Winds: N. N. W., W., W. Stiff double reefed topsail breeze.

July 24. Lat. 52° 58′ S.; long. 78° 04′ W. Barometer, 29.6. Winds: W., W. S. W., S. W. First part, double reefs; middle, close reefs; latter, heavy gales, with hail and snow.

July 25. Lat. 51° 46′ S.; long. 76° 50′ W. Barometer, 29.6. Winds: S. S. W., W. N. W., W. N. W. First part, heavy gales; middle and latter, more moderate.

July 26. Lat. 50° 33′ S.; long. 77° 34′ W. Barometer, 29.6. Winds: W. N. W., W., W. by N. First part, stiff gale; ends single reefs.

July 27. Lat. 50° 42′ S.; long. 77° 38′ W. Barometer, 29.2. Winds: N. W., N. N. W., W. S. W. First part, heavy gale; at 6 P. M., hove to under close-reefed maintopsail, &c.

July 28. Lat. 51° 03′ S.; long. 77° 25′ W. Barometer, 29.2. Winds: W. S. W., W., W. First part, heavy gale, with very dangerous sea; middle, heavy rain squalls; ends more moderate.

July 29. Lat. 50° 07′ S.; long. 77° 47′ W. Barometer, 29.6. Winds: S. W., N. N. W., N. N. W. Stiff breezes; first part, squally.

July 30. Lat. 50° 03′ S.; long. 79° 18′ W. Barometer, 29.2. Winds: N. N. W., W. N. W., W. N. W. Commences calm and cloudy, then heavy gales; middle part, gales; latter, single-reefed topsails.

Southerner (E. Hooper).

July 6, 1852. Lat. 51° 02′ S. (D. R.); long. 64° 20′ W. (D. R.). Temperature of air, 50°; of water, 48°. Commences with strong gales and clear. Wind: S. E., and inclining westerly; 8 P. M. wind shifted S. W.; barometer falling; middle and latter parts, moderate breezes with rain; wind, W. N. W. at noon. Barometer, fell suddenly from 28.80 to 28.35.

July 7. Lat. 50° 36′ S.; long. 64° 26′ W. (D. R.). Comes in with heavy gales and rain. At 8 P. M. the barometer at 28.10; wore ship to the westward. Wind: S. S. E., gale increasing at 10 P. M. At 2 A. M. the gale suddenly increased so much as to knock the vessel's lee sail under water; run her off before the wind and furled maintopsail, then brought by and lay to under storm sails; sea rising fast. At 4 A. M. wind increased to a violent hurricane, keeping the whole of the starboard side under water; decks full up to the hatches; vessel laboring very much. Found it necessary for the safety of the ship and people to throw overboard cargo. Ends with a violent hurricane; the barometer, at 28.10; all hands engaged throwing overboard cargo; heavy sea.

July 8. Lat. 50° 03′ S.; long. 64° 06′ W. Commences as the last ended. The vessel laboring very much and shipping heavy seas; decks filled with water fore and aft; still very unsafe; all hands still throwing overboard cargo. At 11 A. M. the vessel making better weather; stopped throwing overboard the cargo; secured things about decks. Current, N. E., 40 miles in 24 hours. Barometer commences to rise at 5 P. M.; at noon, barometer, 28.50.

July 9. Lat. 50° 34′ S.; long. 63° 28′ W. Barometer, 28.90. Current, N. E., 40 miles in 24 hours. Commences with more moderate S. W. gales; middle and latter parts, strong gales from S. S. W.

July 10. Lat. 51° 21′ S.; long. 62° 14′ W. Barometer, 29.05; temperature of air, 40°; of water, 41°. Current, E. N. E., 20 miles. Commences with fresh S. S. W. gales and squally; middle and latter parts, much the same. At noon, wind west.

July 11. Lat. 52° 43′ S.; long. 62° 33′ W. Barometer, at noon, 29.30; temperature of air, 42°; of water, 40°. Current, E. N. E., 24 miles. Fresh westerly gales, first and middle parts; latter part, moderate southerly winds.

July 12. Lat. 54° 07′ S.; long. 62° 31′ W. Barometer, 29.50; temperature of air, 45°; of water, 40°. Current, E. N. E., 24 miles. Comes in with a moderate southerly wind; at 8 P. M. wind west; tacked south. Ends with a westerly breeze and clear.

July 13. Lat. (D. R.) 55° 50′ S.; long. (D. R.) 64° 08′ W. Barometer, 28.60; temperature of air, 46°; of water, 40°. Current, E. N. E., 30 miles. First part, wind west and moderate; middle part, fresh gales and clear; latter part, heavy gales and cloudy. Ends with the wind at N. W.

July 14. Lat. 57° 03′ S.; long. 65° 53′ W. Barometer at noon, 28.50, and rising; temperature of air, 42°; of water, 40°. Current, N. E. by E., 24 miles. Commences with strong N. W. gales, with rain; middle part, more moderate; latter part, fresh gales at S. S. W. with squalls of snow and hail.

July 15. Lat. 56° 30′ S.; long. 67° 01′ W. Barometer at noon, 29.40; temperature of air, 34°; of

water, 40°. Current, E. N. E., 20 miles. Commences with strong gales, and passing squalls of hail and snow. Barometer rising fast; middle part, a light south wind and clear; latter part, a moderate S. W. wind.

July 16. Lat. (D. R.) 57° 11′ S.; long. (D. R.) 69° 59′ W. Barometer at noon, 28.08; temperature of air, 38°; of water, 40°. Current, E. N. E., 2 miles per hour. Comes in moderate and clear. Wind: W. S. W. inclining northerly. At 3 P. M. saw Cape Horn, bearing, per compass, W. N. W. distant about 25 miles; at 4 P. M. tacked south, and hauled by the wind, to double the cape as sharp as possible; middle part, fresh N. W. winds and clear; latter part, strong gales, with a heavy cross sea; wind N. N. W.

July 17. Lat. 57° 11′ S.; long. 70° 34′ W. Barometer at noon, 28.90; temperature of air, 36°; of water, 41°. Current, E. N. E., 2 miles per hour. Commences with a strong increasing gale, from N. N. W. inclining to west. Barometer, 28.45; moderating during the night; latter part, fresh gales from W. S. W.

July 18. Lat. (D. R.) 58° 01′ S.; long. (D. R.) 72° 48′ W. Barometer at noon, 28.60, and falling. First part, fresh W. S. W. winds, with occasional squalls of snow, rain, and hail; middle part, moderate and clear; latter part, strong N. N. W. gales; lying to.

July 19. Lat. (D. R.) 58° 20′ S.; long. (D. R.) 72° 14′ W. Barometer at noon, 28.50; temperature of air, 46°; of water, 41°. Commences with heavy N. N. W. gales; 2 P.M., barometer, 28.50, and at 6 P. M., 28.20; middle part, strong gales, with rain; midnight, barometer rising; latter part, moderate N. W. gales, and cloudy.

July 20. Lat. (D. R.) 58° 10′ S.; long. 74° 37′ W. Barometer, 28.50; temperature of air, 40°; of water, 41°. Commences with strong gales and overcast; middle, light E. S. E. winds, and thick weather; latter, fresh S. E. gales; hail, snow, and rain.

July 21. Lat. 57° 51′ S.; long. 77° 24′ W. Temperature of air, 44°; of water, 40°. Commences with strong S. E. gales, with snow; middle and latter parts, moderate S. E. winds, with snow; barometer at noon, 28.94.

July 22. Lat. (D. R.) 57° 18′ S.; long. (D. R.) 80° 46′ W. Barometer at noon, 28.70, and rising; temperature of air, 42°; of water, 41°. First part, light baffling winds, and flying clouds; middle part, fresh N. N. E. gales, with snow; latter part, fresh N. N. W. gales, with rain; at noon, wind shifted to S. S. W.; current, during the last three days, E. N. E., 70 miles.

July 23. Lat. 56° 50′ S.; long. 82° 11′ W. Barometer unsteady; temperature of air, 41°; of water, 41°. Current, 26 miles, E. N. E. First part, light S. S. W. wind; at 8 P. M. it shifted to N. N. W., and blew a gale, with rain and snow.

July 24. Lat. 55° 32′ S.; long. 83° 05′ W. Barometer at noon, 28.20; temperature of air, 40°; of water, 41°. Commences with fresh westerly gales, with snow squalls; at 8 P. M. the wind shifted to E. S. E.; barometer falling to 28.00; during the night, heavy gales and squally; 4 A. M. barometer rose to 28.25; latter part, moderating gales, and clear.

July 25. Lat. 54° 27′ S.; long. 81° 37′ W. Barometer at noon, 29.10; temperature of air, 40°; of water, 41°. Current, E. N. E., 2 miles per hour. First part, moderate N. W. gales, and squally; middle

part, strong westerly gales; barometer fell during the night, to 27.90, and at 8 A. M. rose to 28.10; wind shifted to S. W., and blew strong, with snow squalls.

July 26. Lat. (D. R.) 52° 27′ S.; long. (D. R.) 81° 00′ W. Barometer at noon, 29.80; temperature of air, 41°; of water, 42°. First part, strong W. S. W. gales, with heavy squalls of wind, hail, and snow; middle and latter parts, more moderate; at 8 A. M. wind hauled to N. W.; ends light breezes, with overcast sky.

July 27. Lat. 53° 10′ S.; long. 81° 31′ W. Barometer at noon, 27.97; temperature of air, 43°; of water, 42°. Commences with moderate breezes, and cloudy. At 3 P. M. wind N. N. W.; tacked to the westward. Barometer falling. At 8 P. M. blowing a hard gale, with heavy squalls; lying to. Ends with violent gales, and tremendous squalls of wind, hail, and rain from N. N. W.

July 28. Lat. 52° 13′ S.; long. 81° 12′ W. Barometer at noon, 28.77; temperature of air, 48°; of water, 44°. First part, heavy gales, with squalls of wind and hail; at 4 P. M. the wind hauled to west; wore to the north; at 8 P. M. the barometer rose 0.2. Middle and latter parts, fresh W. S. W. gales, with snow and hail squalls.

July 29. Lat. 50° 59′ S.; long. 79° 19′ W. Barometer at noon, 29.10; temperature of air, 46°; of water, 44°. First part, fresh west gales; at 8 P. M. barometer commenced rising; middle and latter parts, light breezes, and fine, clear weather.

July 30. Lat. 50° 55′ S.; long. 80° 15′ W. Barometer at noon, 28.80; temperature of air, 50°; of water, 45°. First part, light N. W. winds, and clear; at 2 P. M. tacked west; at 8 P. M. strong gales which continued from N. N. W.; at 8 A. M. the wind moderating, at west; ends with fine weather.

July 31. Lat. 50° 00′ S.; long. 78° 10′ W. Barometer at noon, 28.95; temperature of air, 52°; of water, 46°. Commences with moderate N. W. winds; middle part, strong gales; at 4 A. M. tremendous heavy gales; lying to under storm fore and aft sails. Barometer in this case gave no warning. Ends with a more moderate wind at west.

Aug. 1. Lat. 50° 23′ S.; long. 78° 38′ W. Barometer at noon, 28.90. Commences with moderate west gales; at 4 P. M. wind hauling northward; wore ship to S. W.; middle and latter parts, heavy gales; lying to under storm sails.

Ship Levanter (Wm. A. Follansbee), New York to San Francisco, 81 days out.

July 14. Lat. 48° 25′ S.; long. 64° 46′ W. Current, easterly, 1½ knots per hour. Barometer, 29.4; temperature of air, 47°; of water, 45°. Winds: W. by N., W. ½ N., W. ½ S. Moderate and pleasant.

July 15. Lat. 50° 33′ S.; long. 64° 10′ W. Current, 1½ knots. Barometer, 29; temperature of air, 44°; of water, 45°. Winds: W. N. W., W. N. W., S. W. by W. First and second parts, moderate; third part, gale.

July 16. Lat. 50° 23′ S.; long. 65° 21′ W. Current, S. E., ¾ knot. Barometer, 29.4; temperature of air, 38°; of water, 44°. Winds: S. W. by W., S. W., S. W. First part, moderate; second and third parts, hard gale, with snow squalls.

July 17. Lat. 53° 15′ S.; long. 64° 56′ W. Barometer, 29.1; temperature of air, 40°; of water, 42°. Winds: W. N. W. to N. W., S. W., S. W. First part, fresh; second part, gale; third part, strong and squally.

July 18. Lat. 54° 40′ S.; long. none. Barometer, 28.8; temperature of air, 45°; of water, 42°. Winds: W. S. W., W. N. W., N. W. Fresh breezes and thick; passed through the Straits of Le Maire.

July 19. Lat. 56° 08′ S.; long. 65° 30′ W. Barometer, 29.8; temperature of air, 41°; of water, 41°. Winds: W. to W. S. W., calm and W., W. N. W. Strong gales and heavy squalls.

July 20. Lat. 56° 44′ S.; long. 67° 22′ W. Barometer, 29.2; temperature of air, 42°; of water, 43°. Winds: W., N. N. W., N. N. W. First part, fresh breezes; second and third parts, strong gales.

July 21. Lat. (D. R.) 57° 10′ S.; long. 67° 56′ W. Barometer, 29.4; temperature of air, 38°; of water, 42°. Winds: N. N. W., W. N. W. to W., S. W. Hard gales; ends calm.

July 22. Lat. 57° 32′ S.; long. 69° 16′ W. Barometer, 28.5; temperature of air, 38°; of water, 41°. Winds: calm, E. N. E., E. N. E. to N. W., E. N. E. to S. S. W. First part, calm; second part, moderate; third part, hard gales and snow.

July 23. Lat. (D. R.) 58° 21′ S.; long. 69° 46′ W. Barometer, 28.5; temperature of air, 38°; of water, 41°. Winds: S. S. W., W. S. W. to W. N. W., N. W. by W. Hard gales and heavy snow squalls.

July 24. Lat. (D. R.) 58° 30′ S.; long. 69° 10′ W. Barometer, 28.9; temperature of air, 36°; of water, 40°. Winds: S. S. W., W. S. W. to S. W., S. W. to W. S. W. Hard gales and heavy snow squalls; calm for 10 minutes.

July 25. Lat. (D. R.) 58° 40′ S.; long. 67° 09′ W. Barometer, 29.2; temperature of air, 25°; of water, 39°. Winds: S. W. throughout. Hard gales; third part, moderate.

July 26. Lat. (D. R.) 58° 08′ S.; long. 67° 34′ W. Barometer, 29.1; temperature of air, 30°; of water, 40°. Winds: S. W., calm, E., calm. First part, moderate; second part, calm; third part, light airs and calm, snowing.

July 27. Lat. 56° 31′ S.; long. 73° 08′ W. Barometer, 29.07; temperature of air, 28°; of water, 40°. Winds: S. E., S. to S. E., S. to S. E. First part, light airs; second and third parts, fresh, and snow squalls.

July 28. Lat. (D. R.) 55° 31′ S.; long. 77° W. Barometer, 30.1; temperature of air, 38°; of water, 41°. Winds: S. E. to S., S. E., S. to W. N. W. First and second parts, moderate and pleasant; third part, light airs and calm.

July 29. Lat. 53° 45′ S.; long. 79° 33′ W. Barometer, 30.2; temperature of air, 40°; of water, 42°. Winds: W. N. W., W. N. W. to W., W. Fresh breezes and squalls of rain.

July 30. Lat. 52° 26′ S.; long. 79° 55′ W. Barometer, 30.1; temperature of air, 40°; of water, 43°. Winds: W., W., W. Fresh breezes and rain squalls, and misty all day.

July 31. Lat. (D. R.) 50° 07′ S.; long. 81° 04′ W. Barometer, 30.2; temperature of air, 44°; of water, 44°. Winds: W. S. W., S. W. by W., W. by S. to W. Moderate breezes and fog showers.

Aug. 1. Lat. 48° 37′ S.; long. 82° 00′ W. Barometer, 30.1; temperature of air, 48°; of water, 46°. Winds: W. by S., W. S. W. to S. W., S. to S. W. Moderate breezes and foggy; latter, nearly calm.

Eliza Mallory (John E. Williams).

July 30, 1852. Lat. 50° 38′ S.; long. 62° 34′ W. Barometer, 29.8; temperature of air, 46°. Winds: S. S. E., E., N. E. First part, calm, and light winds; middle and latter, strong. Barometer, going down.

July 31. Lat. 53° 34′ S.; long. 64° 41′ W. Barometer, 29.3; temperature of air, 40°. Wind: N. N. E.; strong breezes, cloudy, thick, and rainy.

Aug. 1. Lat. 54° 36′ S.; long. 63° 15′ W. Barometer, 29.3; temperature of air, 40°. Winds: N. W. to W., W., W. First part, strong breezes from N. W., and thick; middle, wind shifting to west, cleared up, blowing strong gale. At 8 A. M. made Staten Land; unsettled glass, going up and down.

Aug. 2. Lat. 54° 31′ S.; long. 65° 40′ W. Barometer, 29.02; temperature of air, 40°. Winds: N. W., N. N. W., N. N. W. First part, strong gale; at 6 P. M. passed close to Cape St. John, heavy squalls off the land; latter part, squalls not so heavy; at daylight, made Terra del Fuego.

Aug. 3. Lat. 56° 00′ S.; long. not observed. Barometer, 29.2; temperature of air 42°. Winds: N. N. W., N. First part, strong gale; middle, heavy squalls, with snow; latter, pleasant. At noon, about 20 miles east of Cape Horn.

Aug. 4. No observations. Barometer, 29.05; temperature of air, 37°. Winds: N., W., W. First part, moderate and pleasant; at 5 P. M. Cape Horn bore north, distant about five miles; at 8 P. M. heavy bank coming up from the west, and barometer going down; at midnight, close-reefed; latter part, hail squalls. At 7 A. M. made the Diego Rocks.

Aug. 5. Lat. 57° 28′ S.; long. 69° 00′ W. Barometer, 29.1; temperature of air, 38°. Wind: W. N. W. First part, strong gale, with hail squalls; middle, more moderate; latter part, moderating; under top-gallant sails.

Aug. 6. Lat. 57° 02′ S.; long. 70° 51′ W. Barometer, 29.00; temperature of air, 40°. Winds: N. W., N., N. N. E. First part, strong breezes and rain squalls. Ends, light and baffling; heavy sea from west; weather looks bad.

Aug. 7. Lat. 56° 04′ S.; long. 72° 30′ W. Barometer, 29.5; temperature of air, 36°. Winds: S., S. W., S. W. First part, light; middle, hail and snow squalls—under close reefs; latter part, more moderate; made sail.

Aug. 8. No observation. Barometer, 29.3; temperature of air, 38°. Winds: W. to W. N. W., N. W., N. First part, strong breezes, and baffling. Barometer, going down; at 3 P. M. it stood at 28.85. Ends, with snow and rain—double reefs.

Aug. 9. Lat. 54° 30′ S.; long. 73° 36′ W. Barometer, 29.5; temperature of air, 34°. Winds: N. W., S. W., S. W. First part, all sorts of weather—fog, rain, and calm, with heavy sea from N. W.; middle part, strong gale; latter, more moderate, but still squally.

Aug. 10. No observation. Barometer, 30.2; temperature of air, 34°. Winds: S. W., S. W., E.

First part, strong breezes, with snow and hail squalls; middle, moderate breezes, and baffling; latter, moderate and cloudy. The weather changes very quick about here; from all sail to close reefs.

Aug. 11. Lat. 48° 38′ S.; long. 83° 25′ W. Barometer, 29.8; temperature of air, 44°. Winds: E. N. E., E. N. E., N. E. First part, strong breezes; middle part, same; barometer going down fast; latter, strong and hazy; heavy sea from the north.

Ship Pelican State (S. Weeks), Philadelphia to San Francisco, 76 days out.

July 30. Lat. 50° 30′ S.; long. 64° 45′ W. Barometer, 30.03; temperature of air, 41° of water, 43°. Winds: calm, S. W., S. W. First part, calm; second part, moderate; third part, fresh breeze.

July 31. Lat. 51° 17′ S.; long. 66° 00′ W. Barometer, 30; temperature of air, 41°; of water, 42°. Winds: W. S. W., S. W., W. S. W. Fresh breezes and pleasant.

Aug. 1. Lat. 52° 58′ S.; long. 66° 10′ W. Barometer, 29.7; temperature of air, 42°; of water, 42°. Winds: W. S. W. throughout. Strong gales and squally. Barometer falling.

Aug. 2. Lat. 54° 18′ S.; long. 65° 35′ W. Barometer, 29.8; temperature of air, 42°; of water, 42°. Winds: S. W., N., N. W. First part, moderate weather, dark and cloudy.

Aug. 3. Lat. 55° 00′ S.; long. 63° 32′ W. Barometer, 29.5; temperature of air, 38°; of water, 42°. Winds: N. W., S. W., S. W. First part, moderate. Should have gone through Straits of Le Maire, but wind contrary, south, and night coming on, thought it prudent to go round Staten Land. Third part, gales with squalls of hail and snow. Current, E. N. E., 15 miles.

Aug. 4. Lat. 55° 30′ S.; long. 63° 32′ W. Barometer, 29.8; temperature of air, 30°; of water, 41°. Winds: S. S. W., S., S. Heavy gales with squalls of snow and hail. Current, E. N. E., 36 miles.

Aug. 5. Lat. 55° 50′ S.; long. 64° 00′ W. Barometer, 30.2; temperature of air, 31°; of water, 40°. Winds: S., S., S. S. E. Strong gales and dark cloudy weather. Current, E. N. E., 30 miles.

Aug. 6. Lat. 55° 25′ S.; long. 64° 20′ W. Barometer, 30.3; temperature of air, 33°; of water, 41°. Wind: S. S. E. throughout. First part, strong winds and heavy squalls of snow. Second part, strong gales. Third part, moderate. Strong current setting northward at E. N. E., 40 miles.

Aug. 7. Lat. 55° 25′ S.; long. 63° 45′ W. Barometer, 30.3; temperature of air, 33°; of water, 35°. Winds: S., S., S. W.; moderate snow squalls and cloudy.

Aug. 8. Lat. 56° 40′ S.; long. 63° 40′ W. Barometer, 30.1; temperature of air, 38°; of water, 35°. Wind: S. W. throughout; moderate and dark cloudy weather. Current, E., 20 miles.

Aug. 9. Lat. 57° 00′ S.; long. 63° 00′ W. Barometer, 29.5; temperature of air, 38°; of water, 35°. Winds: S. W., W. N. W., W. N. W.; moderate. Second part, light; third part, calm. Current, E., 20 miles.

Aug. 10. Lat. 57° 18′ S.; long. 63° 30′ W. Barometer, 29.5; temperature of air, 41°; of water, 42°. Winds: N. W., calm, calm. First part, light airs and dark cloudy weather; second part, calm and baffling; third part, calm. Current, E. N. E., 20 miles.

Aug. 11. Lat. 57° 10′ S.; long. 66° 33′ W. Barometer, 29.5; temperature of air, 41°; of water, 42°.

Winds: W.N.W. First part, light airs and dark cloudy weather; second part, baffling; third part, light breezes. Current, E., 25 miles.

Aug. 12. Lat. 57° 40′ S.; long. 68° 30′ W. Barometer, 29.8; temperature of air, 35°; of water, 38°. Winds: W.S.W., W.S.W., E. First and second parts, fresh breezes and rainy; third part, light winds and cloudy; strong tide rips. Current, E. by N., 35 miles.

Aug. 13. Lat. 56° 49′ S.; long. 73° 20′ W. Barometer, 29.5; temperature of air, 42°; of water, 40°. Winds: N.E., N.E., N.N.E. First part, light airs; second part, moderate; third part, fresh breezes. Current, E. by N., 30 miles.

Aug. 14. Lat. 55° 57′ S.; long. 75° 53′ W. Barometer, 29.3; temperature of air, 44°; of water, 40°. Winds: N.E., N.E., N.N.E. First part, fresh; second part, light and baffling, and cloudy; third part, light winds. Current, E., 15 miles.

Aug. 15. Lat. 55° 44′ S.; long. 76° 30′ W. Barometer, 29; temperature of air, 45°; of water, 42°. Winds: E., calm, calm. First part, light winds and cloudy; second and third parts, calm. Current, E., 15 miles.

Aug. 16. Lat. 54° 08′ S.; long. 78° 45′ W. Barometer, 28.5; temperature of air, 46°; of water, 43°. Wind: E., S.E., S. First part, light airs; second part, fresh and squally, with snow; third part, light airs. Current, E., 20 miles.

Aug. 17. Lat. 53° 48′ S.; long. 80° 45′ W. Barometer, 29.3; temperature of air, 45°; of water, 43°. Winds: S., S., S. First part, light airs; second and third parts, fresh gales and rainy. Current, E., 20 miles.

Aug. 18. Lat. 53° 20′ S.; long. 82° 00′ W. Barometer, 29.00; temperature of air, 42°; of water, 40°. Winds: variable, variable, calm. First and second, variable; third, from calms to strong gales, and fine weather to squalls of snow and rain. Current, E., 20 miles.

Aug. 19. Lat. 51° 16′ S.; long. 83° 30′ W. Barometer, 29.3; temperature of air, 41°; of water, 42°. Winds: calm, S.W., S.W. First part, calm; second, fresh southwest gales with squalls of snow and hail; third, moderate. Current, E.S.E., 30 miles.

Aug. 20. Lat. 48° 10′ S.; long. 84° 30′ W. Barometer, 30.00; temperature of air, 46°; of water, 48°. Wind: S.W. throughout. Fresh gales with heavy squalls of wind, rain, hail, and snow. Current, S.E., 20 miles.

Ship White Swallow (F. W. Lovett), Boston to San Francisco, 86 days out.

Aug. 21, 1853. Lat. 49° 33′ S.; long. 62° 55′ W. Barometer 29.40; temperature of air, 33°; of water, at surface, 32°; at 10 feet below surface, 35°. Winds: W., S., S. Fresh breezes and pleasant. At 10, wind changed to south in a squall, and blew a gale for the remainder of the day. Hail and snow.

Aug. 22. Lat. 50° 40′ S.; long. 63° 50′ W. Barometer, 29.40; temperature of air, 40°; of water, 35°; do. 36°. Winds: S.W., W.N.W., W.N.W. Fresh gales; cloudy and cold.

Aug. 23. Lat. 53° 15′ S.; long. 62° 46′ W. Barometer, 29.25; temperature of air, 41°; of water, 34°; do. 35°. Winds: W., W. S. W., W. S. W. Strong gales; middle and latter, more moderate.

Aug. 24. Lat. 55° 38′ S.; long. 61° 46′ W. Barometer, 28.67; temperature of air, 37°; of water, 34°; do. 35°. Winds: W., N. E., W. First part, fresh breezes; middle and latter, strong gales.

Aug. 25. Lat. 55° 42′ S.; long. 60° 42′ W. Barometer, 28.38; temperature of air, 29°; of water, 38°; do. 37°. Winds: W. by S., W. S. W., S. W. First part, gales with hail and snow; middle, more moderate; latter, light breezes. Heavy westerly swell.

Aug. 26. Lat. 56° 29′ S.; long. 62° 56′ W. Barometer, 58.67; temperature of air, 38°; of water, 36°; do. 37°. Winds: S., N. E., W. All kinds of weather; middle, light and calm; latter, strong gale with hail and snow.

Aug. 27. Lat. 56° 16′ S.; long. 63° 33′ W. Barometer, 28.63; temperature of air, 38°; of water, 26°; do. 27°. Winds: W., calm, S. W. Commences fresh gale; middle, quite moderate; latter, calm and thick, snow storm.

Aug. 28. Lat. 56° 14′ S.; long. 65° 10′ W. Barometer, 29.50; temperature of air, 39°; of water, 37°; do. 37°. Winds: calm, W., N. W. Commences light airs and snow; middle, light; ends same.

Aug. 29. Lat. 57° 00′ S.; long. 67° 40′ W. No observation. Barometer, 29.07; temperature of air, 40°; of water, 38°; do. 38°. Winds: N. W., W. N. W., N. E. Commences fresh breezes; middle, wind working southerly with rain; latter, N. E. to N. W.; moderate and raining.

Aug. 30. Lat. 57° 40′ S.; long. 70° 30′ W. Barometer, 28.65; temperature of air, 41°; of water, 39°; do. 38°. Winds: N. W., N. W., W. N. W. Fresh breezes and raining.

Aug. 31. Lat. 58° 42′ S.; long. 71° 41′ W. Current, east, 36 miles. Barometer, 28.40; temperature of air, 40°; of water, 38°; do. 37°. Winds: W. N. W., W. N. W., N. N. W. Strong breeze, heavy squalls, with snow and hail; midnight, moderate.

Sept. 1. Lat. 59° 18′ S.; long. 73° 11′ W. Strong easterly current. Barometer, 28.30; temperature of air, 40°; of water, 38°; do. 37°. Winds: W. N. W., W. N. W., N. N. E. Fresh breezes and squally, with snow and hail.

Sept. 2. Lat. 58° 32′ S.; long. 74° 00′ W. Current, east, strong. Barometer, 28.37; temperature of air, 40°; of water, 39°; do. 37°. Winds: N. N. E., W., S. S. E. Commences light breezes, and snow; middle, light; ends good breeze.

Sept. 3. Lat. 55° 24′ S.; long. 76° 15′ W. Current, east, 1½ knots per hour. Barometer, 29.05: temperature of air, 39°; of water, 38°; do. 38°. Winds: S., S. W., W. Fine breeze. During the last four days we have had an easterly current, from 1 to 1½ knots per hour.

Sept. 4. Lat. 54° 27′ S.; long. 76° 25′ W. Current, east, 1 knot per hour. Barometer, 29.05; temperature of air, 40°; of water, 39°; do. 38°. Winds: W., W. N. W., N. W. Commences fresh breezes, and cloudy; ends heavy gales and squally, with hail, rain, and snow.

Sept. 5. Lat. 52° 57′ S.; long. 76° 22′ W. Barometer, 29.10; temperature of air, 41°; of water,

40°; do. 38°. Winds: N. W., W. N. W., W. N. W. Strong gales, with hail and snow; middle, more moderate.

Sept. 6. Lat. 49° 52′ S.; long. 79° 29′ W. Barometer, 29.50; temperature of air, 44°; of water, 43°; do. 42°. Winds: W. N. W., S. W., S. W. Strong breeze, with heavy squalls, with rain and hail; at 4 P.M., wind hauled to S. W. in a squall, and lasted strong throughout the day.

Ship Corinne (John K. Stickney), New York to San Francisco, 92 days out.

July 29. Lat. 49° 09′ S.; long. 64° 52′ W. Current, west, half knot per hour. Barometer, 30.26; temperature of air, 37°; of water, 43°. Winds: S. to S. E., calm, calm. First part, squally, and fresh winds; second and third, light airs and calm.

July 30. Lat. 51° 11′ S.; long. 64° 52′ W. Barometer, 30.03; temperature of air, 39°; of water, 42°. Winds: S. by W., S. W., W. S. W. First, light airs and cloudy; second and third, moderate and pleasant.

July 31. Lat. 52° 35′ S.; long. 65° 00′ W. Barometer, 29.77; temperature of air, 41°; of water, 41°. Winds: W. by S., S. W. by W., S. W. by W. First, moderate; second, hard gales; third, moderate.

Aug. 1. Lat. 54° 23′ S.; long. 64° 03′ W. Barometer, 29.50; temperature of air, 40°; of water, 42°. Wind: S. W. throughout. First, moderate; second, suddenly a furious gale; third, hard gale.

Aug. 2. Lat. 54° 33′ S.; long. 63° 50′ W. Barometer, 29.60; temperature of air, 39°; of water, 42°. Winds: S. W., W. S. W., W. N. W. First, hard gales; second, same; third, more moderate, and thick weather.

Aug. 3. Lat. 56° 21′ S.; long. 63° 08′ W. Barometer, 29.20; temperature of air, 35°; of water, 36°. Winds: W. S. W. to W., S. W. by W., S. W. by W. First, fresh breezes and thick; second, light breezes and thick; third, strong breezes, with squalls of sleet and snow.

Aug. 4. Lat. 56° 25′ S.; long. 63° 24′ W. Barometer, 29.92; temperature of air, 26°; of water, 34°. Winds: S. by W., S. S. E., S. S. E. First part, fresh gale and thick snow; second, hard gale, with heavy squalls of sleet and snow; third, moderating.

Aug. 5. Lat. 56° 40′ S.; long. 66° 17′ W. Barometer, 30.30; temperature of air, 34°; of water, 40°. Winds: S. S. E. to S., S. S. E., S. S. E. to S. First part, fresh gales and frequent snow squalls; second, moderating; third, moderate and cloudy.

Aug. 6. Lat. 56° 57′ S.; long. 66° 22′ W. Barometer, 30.38; temperature of air, 33°; of water, 41°. Winds: S. S. E. to S. S. W. throughout; winds variable, with frequent squalls of snow and sleet.

Aug. 7. Lat. 50° 40′ S.; long. 65° 50′ W. Barometer, 30.10; temperature of air, 34°; of water, 39°. Winds: S. to S. S. W., S. W., S. W. by W.; fresh and flawy, also cloudy.

Aug. 8. Lat. 58° 49′ S.; long. 66° 06′ W. Current, N. E. strong, rate not ascertained. Barometer, 29.86; temperature of air, 36°; of water, 37°. Winds: S. W., S. W. by W., W. by S.; squally and cloudy.

Aug. 9. Lat. 60° 07′ S.; long. 68° 06′ W. Current, E. N. E., 1 mile per hour. Barometer, 29.54;

temperature of air, 36°; of water, 31°. Winds: W., W., W. S. W.; moderate, with frequent squalls of sleet and snow, and drizzling rain.

Aug. 10. Lat. 59° 42′ S.; long. 69° 11′ W. Current, easterly. Barometer, 29.55; temperature of air, 34°; of water, 37°. Winds: W. S. W., S. W. to W. S. W., S. S. W. to S. S. E.; light variable winds, and calms; squalls of snow and sleet.

Aug. 11. Lat. 59° 39′ S.; long. 71° 05′ W. Current, for 56 hours, N. 87° E., 54 miles. Barometer, 29.56; temperature of air, 34°; of water, 38°. Winds: S. E. by S., S. E. by E., E. First part, light airs; second, moderate; third, fresh and cloudy.

Aug. 12. Lat. 58° 25′ S.; long. 76° 18′ W. Current, easterly. Barometer, 29.72; temperature of air, 33°; of water, 39°. Winds: E., E., E. to N. E. First part, fresh, with snow squalls; second, moderate, with snow; third, fresh snow squalls and sleet.

Aug. 13. Lat. 57° 09′ S.; long. 78° 00′ W. Current, for 48 hours, S. 71° E., 42 miles. Barometer, 29.35; temperature of air, 40°; of water, 40°. Winds: N. N. E. to calm, N. E., do. First part, strong and rainy, calm for a few moments; second, light airs; third, moderate, and drizzling rain.

Aug. 14. Lat. 55° 27′ S.; long. 81° 30′ W. Current, S. 17° E., 29 miles. Barometer, 28.85; temperature of air, 38°; of water 40°. Wind: N. E. throughout. First and second parts, fresh breezes and thick weather; third, light airs and calms, thick fog.

Aug. 15. Lat. 54° 23′ S.; long. 83° 10′ W. Barometer, 29.07; temperature of air, 40°; of water, 40°. Winds: N. E., calm and baffling, S. S. E. First, light breezes and dense fog; second, calm and baffling airs; third, gentle breezes.

Aug. 16. Lat. 53° 37′ S.; long. 83° 46′ W. Barometer, 29.22; temperature of air, 37°; of water, 40°. Winds: S. S. E., S. W to N. W., S. W. to N. W. Light variable breezes; latter, squalls of rain.

Aug. 17. Lat. 52° 38′ S.; long. 84° 14′ W. Barometer, 29.03; temperature of air, 42°; of water, 41°. Winds: W. to W. N. W., W. N. W. to N. N. W., W. to W. N. W. Fresh breezes and squally weather.

Aug. 18. Lat. 52° 00′ S.; long. 84° 13′ W. Barometer, 28.85; temperature of air, 40°; of water, 41°. Winds: W. N. W., W. N. W., W. N. W. to W. S. W. First, fresh and squally; second, fresh gales, squally with sleet and rain; third, fresh breezes and squally.

Aug. 19. Lat. 50° 12′ S.; long. 84° 40′ W. Barometer, 29.45; temperature of air, 40°; of water, 42°. Winds: S. W. by S. throughout. Strong gales; heavy squalls of snow and hail.

"Your Sailing Directions, with the accompanying Charts, contain much valuable information, and I would recommend them to every shipmaster, in whatever trade he may be, with regard to doubling Cape Horn. I should prefer running down between the parallels of 58° and 60°, rather than contend with adverse winds, heavy sea, and strong easterly currents, between 58° and the cape. I experienced smooth sea, good weather, and easterly winds, while other ships 2° or 3° N. of me were fighting westerly gales, and had a much stronger easterly set."

Ship Wild Ranger (J. Henry Sears), Boston to San Francisco, 60 days out.

Aug. 20, 1853. Lat. 51° 00′ S.; long. 62° 00′ W. Barometer, 29.50; temperature of air, 36°; of water, 36°. Winds: S. W., W. S. W., W. S. W. Moderate breezes and pleasant.

Aug. 21. Lat. 51° 40′ S.; long. 63° 10′ W. Barometer, 29.95; temperature of air, 31°; water, 32°. Wind: S. S. W. throughout. First part, light winds; at 4 P. M. made Cape Percival (Falkland Islands); at 8 P. M. violent squall from S. S. E.; ends moderate.

Aug. 22. Lat. 54° 25′ S.; long. 63° 50′ W. Barometer, 29.60; temperature of air, 34°; of water, 35°. Winds: W. S. W., S. W., S. W. Strong breezes and squally; snow and hail.

Aug. 23. Lat. 55° 00′ S.; long. 64° 00′ W. Northerly current. Barometer, 29.30; temperature of air, 32°; of water, 34°. Wind: S. W. throughout. At 1 P. M. made east end of Staten Land, bearing S. ½ W.; strong gales and heavy snow squalls.

Aug. 24. Lat. 56° 00′ S.; long. 64° 20′ W. Current, N. E., 1½ knots per hour. Barometer, 28.40; temperature of air, 29°; of water, 31°. Winds: W. N. W., S. W., S. W. At 6 P. M. Staten Land bore W. N. W. 25 miles; strong gales from S. W.

Aug. 25. Lat. 55° 23′ S.; long. 63° 30′ W. Current, east, 2 knots per hour. Barometer, 28.80; temperature of air, 28°; of water, 30°. Winds: S. W., S. W., S. S. W. Strong gales and heavy snow squalls; ends more moderate.

Aug. 26. Lat. 56° 08′ S.; long. 62° 40′ W. Current, east, 3 knots per hour. Barometer, 28.10; temperature of air, 27°; of water, 27°. Winds: S. by W., N. W., W. S. W. Commences moderate breezes and cloudy; midnight, fresh breezes, squally weather; ends a heavy gale.

Aug. 27. Lat. 56° 20′ S.; long. 63° 00′ W. Current, same. Barometer, 28.30; temperature of air, 30°; of water, 32°. Winds: W. S. W., S. W., W. S. W. Commences heavy gales; ends more moderate.

Aug. 28. Lat. 56° 28′ S.; long. 64° 00′ W. Current, east, 1½ knots per hour. Barometer, 28.60; temperature of air, 36°; of water, 34°. Winds: calm, S. W., N. W. First and middle parts, light and calm; ends moderate, cloudy, with rain.

Aug. 29. Lat. 56° 53′ S.; long. 67° 48′ W. Current, east, 1 knot per hour. Barometer, 28.85; temperature of air, 38°; of water, 36°. Winds: W., calm, N. W. First and middle, light airs and calm; ends fresh breezes, thick and rainy.

Aug. 30. Lat. 57° 30′ S.; long. 70° 22′ W. Current, east, 1 knot per hour. Barometer, 28.80; temperature of air, 41°; of water, 39°. Winds: W. N. W., W. N. W., W. N. W. Strong breezes and rainy.

Aug. 31. Lat. 58° 23′ S.; long. 72° 17′ W. Current, east, 1 knot per hour. Barometer, 28.80; temperature of air, 36°; of water, 37°. Winds: W. N. W., W., W. Strong gales, and squally; snow.

Sept. 1. Lat. 51° 17′ S.; long. 73° 20′ W. Current, east, 1 knot per hour. Barometer, 28.75; temperature of air, 34°; of water, 36°. Winds: W. N. W., N. W., N. W. Fresh breezes and squally.

Sept. 2. Lat. 56° 55′ S.; long. 73° 40′ W. Current, east, 28 miles. Barometer, 28.80; temperature of air, 36°; of water, 36°. Winds: W., W. N. W., W. N. W. Strong breezes and squally.

Sept. 3. Lat. 54° 38′ S.; long. 76° 20′ W. Current, east, 29 miles. Barometer, 29.40; temperature of air, 35°; of water, 34°. Winds: W. S. W., S. W., W. Strong breezes, and heavy snow squalls.

Sept. 4. Lat. 53° 41′ S.; long. 77° 14′ W. Barometer, 29.50; temperature of air, 36°; of water, 35°. Winds: W. S. W., S. W., W. N. W. Strong breezes and squally.

Sept. 5. Lat. 52° 15′ S.; long. 77° 42′ W. Current, south, 12 miles. Barometer, 29.80; temperature of air, 39°; of water, 37°. Winds: W. N. W., W. S. W., W. Fresh breezes and squalls of hail and rain: hope I am 'most clear of bad weather and worse winds.

Sept. 6. Lat. 49° 21′ S.; long. 80° 55′ W. Current, south, 12 miles. Barometer, 29.95; temperature of air, 43°; of water, 40°. Winds: W. S. W., S. W., S. Fresh breezes, with squalls of hail and rain; latter part, wind hauling to south; first fair wind for a month.

"SAN FRANCISCO, *October* 25, 1853.

"I followed your track to the equator for July, and had a passage of 28 days to the equator; crossed in 32° 30′, just clear of Rocas, and then had a very hard chance to Cape Horn. I highly approve of your track from Boston to the equator, and have no doubt but that I gained by following your instructions.

"I found very little current near St. Roque. I intended to have gone through the Straits of Le Maire, but the wind being S. W., I could not get far enough to westward, and thought it better to pass east end of Staten Land. With regard to a passage around Cape Horn, I would say I have seen worse weather between Boston and Liverpool, in September, than I have seen yet in this passage. North of equator, I had a long spell of calm weather which prolonged my passage; but find, on arrival, that I was in company with four other clipper ships, and all arrived here same day."

Barque Mermaid (George Smith), Pernambuco to San Francisco, from Cape St. Roque, 31 days.

Aug. 20, 1851. Lat. 50° 30′ S.; long. 65° 35′ W. Winds: N. W., N. N. W., and N. N. E. Fresh breezes.

Aug. 21. Lat. 54° 31′ S.; long. 65° 16′ W. Winds: W. N. W., W., and W. S. W. Fresh gales. At meridian, Cape St. Diego bore S. E., distant 10 miles.

Aug. 22. Lat. 56° 14′ S.; long. 64° 16′ W. Winds: W. S. W., S. W. by W., W. S. W. At 1 P. M. entered the Straits of Le Maire, and was set to the southward by a tide at the rate of 6 miles per hour. At 5 P. M. Cape Good Success bore N. W., distant 25 miles. After getting through the straits, experienced a heavy irregular sea from the S. W., which lasted until midnight; latter part, squally.

Aug. 23. Lat. 57° 05′ S.; long. 65° 12′ W. Winds: W. S. W., S. W., and S. by W. Squally weather.

Aug. 24. Lat. 56° 45′ S.; long. 67° 35′ W. Winds: N. W., S. S. W., N. Unsteady wind; ship under all sail.

Aug. 25. Lat. 57° 30′ S.; long. 70° 45′ W. Winds: N. N. E., N. W., and W. Temperature of air, 43°; of water, 41°. Strong winds; made Diego Island.

Aug. 26. Lat. 57° 20′ S.; long. 70° W. Temperature of air, 40°; of water, 41°. Winds: W. N. W., N. W., and N. W. Heavy gales; hove to.

Aug. 27. Lat. 57° 40′ S.; long. 71° 10′ W. Temperature of air, 39°; of water, 41°. Winds: N. N. W., W., and W. Strong gales; under close reefs.

Aug. 28. Lat. 56° 48′ S.; long. 72° 50′ W. Temperature of air, 38°; of water, 41°. Winds: W. S. W., S., and S. First part, strong gales; middle and latter part, moderate.

Aug. 29. Lat. 55° 19′ S.; long. 78° 00′ W. Temperature of air, 38°; of water, 41°. Winds: S., S. S. W., and S. W. Fresh wind.

Aug. 30. Lat. 53° 12′ S.; long. 79° 00′ W. Temperature of air, 39°; of water, 42°. Winds: S. W., W., and W. N. W. First part, moderate; middle and latter parts, squally.

Aug. 31. Lat. 51° 45′ S.; long. 78° 45′ W. Temperature of air, 41°; of water, 43°. Winds: W. N. W., N. W., and W. N. W. Fresh gales, and squally.

Sept. 1. Lat. 51° 10′ S.; long. 78° 18′ W. Temperature of air, 43°; of water, 43°. Winds: N. W., W. N. W., and N. E. Fresh winds.

Sept. 2. Lat. 49° 42′ S.; long. 80° 10′ W. Temperature of air, 44°; of water, 44°. Winds: N. E., N. W., and E. First and latter parts, moderate; middle part, squally.

Ship Queen of Clippers (John Zerega), New York to San Francisco, 61 days out.

Aug. 30. Lat. 49° 53′ S.; long. 64° 57′ W. Barometer, 29.30; temperature of air, 47°; of water, 43°; water, at 12 feet 2 inches below surface, 43°. Winds: N. W. by W., W. N. W., W. by S. First, moderate; second and third, fresh and squally.

Aug. 31. Lat. 54° 05′ S.; long. 65° 00′ W. Barometer, 29; temperature of air, 39°; surface of water, 43°; below surface, 12 feet 2 inches, 43°. First, moderate and squally; second, fresh; third, blowing hard in squalls.

Sept. 1. Lat. 54° 52′ S.; long. 65° 02′ W. Barometer, 29; temperature of air, 42°; of water, at surface, 41°; below, 41°. Winds: W. by N., W. N. W., N. First and second, strong gales; third part, light winds.

Sept. 2. Lat. 56° 08′ S.; long. 65° 27′ W. Barometer, 28.70; temperature of air, 36°; of water, at surface, 40°; below, 40°. Winds: W. N. W., S. S. W., W. by S. First, light winds and strong tide rips; second, calm; third, heavy gales and squalls of hail.

"I see in your book of Directions that some of the captains state that they do not consider the barometer as a guide in high southern latitudes; but I differ from them. Although I may not have had as much experience as some of them—having been thirteen years at sea, of which time I have been captain six years—I think if the glass falls three or four-tenths in a few hours, it will be succeeded by a gale and very heavy gust, which will last several hours—although the simple fact that the barometer falls, does not, as a

natural consequence, predict wind; it only shows that there is a commotion in the atmosphere in your vicinity, which may be succeeded by wind or rain, but I think more likely by the former."

Sept. 3. Lat. 56° 30′ S.; long. 66° 50′ W. Barometer, 29; temperature of air, 34°; surface of water, 40°; below, 40°. Winds: W. by S., W. by E., S. S. W. Strong gales and snow squalls.

Sept. 4. Lat. 57° 28′ S.; long. 66° 50′ W. Barometer, 29.3; temperature of air, 36°; of water, 40°; below surface, 40°. Winds: "not put down." Squally and misty weather.

Sept. 5. Lat. 58° 37′ S.; long. 68° 15′ W. Barometer, 29.00; temperature of air, 35°; of water, 40°; below surface, 40°. Current, E., 1¼ knots. Winds: W. ½ S., W., W. by N. Heavy gales and squalls.

Sept. 6. Lat. 58° 00′ S.; long. 69° 40′ W. Barometer, 29.03; temperature of air, 31°; of water, 40°; below surface, 40°. Current, E., 1¼ knots. Winds: W., S., S. by W. First, gales; second, gales and snow squalls; third, blowing very hard.

Sept. 7. Lat. 56° 09′ S.; long. 73° 33′ W. Barometer, 30.18; temperature of air, 33°; of water, 40°; below surface, 40°. Current, N. E., 1 knot. First part, gales; second, more moderate; third, fine weather.

Sept. 8. Lat. 54° 29′ S.; long. 76° 00′ W. Barometer, 30.03; temperature of air, 32°; of water, 40°; below surface, 40°. Winds: S. by W., S. W. by S., S. E. First and second, moderate, with rain squalls; latter, light airs and calm.

Sept. 9. Lat. 53° 30′ S.; long. 80° 13′ W. Barometer, 29.05; temperature of air, 36°; of water, 40°; below surface, 40°. Winds: E., E., N. W. Light breezes and squally.

Sept. 10. Lat. 53° 05′ S.; long. 82° 30′ W. Barometer, 29.00; temperature of air, 36°; of water, 40°; below surface, 40°. Winds: N. W. by N., N. N. W., W. by N. Strong gales.

Sept. 11. Lat. 50° 24′ S.; long. 82° 00′ W. Barometer, 29.40; temperature of air, 40°; of water, 42°; below surface, 42°. Winds: N. W. by N., S. W., W. First part, strong gales and misty; second, moderate; third, moderate and squally.

Ship John Bertram (F. Lendholm), Boston to San Francisco, 58 days out.

Aug. 28, 1853. Lat. 49° 27′ S.; long. 65° 17′ W. Barometer, 29.70; temperature of air, 49°; of water, 43°. Winds; W. by S., S. W. by W., N. W. by W. First and middle parts, light breezes. Sounded in 60 fathoms. Ends fine breezes and pleasant.

Aug. 29. Lat. 51° 55′ S.; long. 66° 30′ W. Barometer, 29.46; temperature of air, 46°; of water, 41°. Winds: W. N. W., W. N. W., N. W. First and middle parts, light breezes; latter part, faint airs.

Aug. 30. Lat. 54° 03′ S.; long. 65° 32′ W. Barometer, 29.07; temperature of air, 46°; of water, 41°. Winds: variable, variable, N. W. Commences light variable airs. Ends fine breeze.

Aug. 31. Lat. 56° 45′ S.; long. 66° 57′ W. Barometer, 29.00; temperature of air, 43°; of water, 41°. Winds: N. W., N. W. by N., W. by S. Commences with fine breezes and pleasant. At 2 P. M. Cape St. Diego bore, by compass, S. E. At 3 hours 30 min. P. M. passed it and entered Straits of Le Maire. Becalmed two hours. A strong northerly current. At 7 P. M. clear of the straits. Middle, unsteady winds with snow. At 6 hours 30 min. A. M. Cape Horn bore W. ½ S. Ends strong gales.

Sept. 1. Lat. 57° 06′ S.; long. 69° 01′ W. Barometer, 28.82; temperature of air, 44°; of water, 42°. Winds: W., W. S. W., W. by S. First part, moderate breezes with frequent snow squalls; middle, dark gloomy weather; ends with unsteady winds and snow squalls.

Sept. 2. Lat. 57° 27′ S.; long. 69° 45′ W. Barometer, 28.70; temperature of air, 37°; of water, 39°. Winds: W. by S., W. S. W., W. by N. Moderate breezes with snow squalls, and a high sea.

Sept. 3. Lat. 56° 02′ S.; long. 72° 00′ W. Current, E. N. E., 26 miles. Barometer, 28.97; temperature of air, 37°; of water, 40°. Winds: variable, S., W. S. W. First, light baffling winds; middle and latter, fresh breezes with snow squalls.

Sept. 4. Lat. 57° 21′ S.; long. 73° 13′ W. Barometer, 29.28; temperature of air, 40°; of water, 40°. Winds: W. S. W., W. S. W., W. by N.; strong gales with a heavy sea.

Sept. 5. Lat. 58° 17′ S.; long. 74° 01′ W. Barometer, 29.07; temperature of air, 38°; of water, 39°. Winds: W. S. W., W., W. N. W.; heavy gales and a heavy sea.

Sept. 6. Lat. 57° 24′ S.; long. 74° 28′ W. Current (two days), E., 29 miles. Barometer, 29.00; temperature of air, 25°; of water, 39°. Winds: W., W. S. W., S. S. W.; strong gales and heavy sea; long and heavy squalls.

Sept. 7. Lat. 56° 10′ S.; long. 77° 28′ W. Barometer, 30.23; temperature of air, 39°; of water, 40°. Winds: S. S. W., S. S. W., S. W. by S. First part, strong gales and stronger squalls; middle, strong breezes and squally; ends, moderate breezes and cloudy.

Sept. 8. Lat. 54° 56′ S.; long. 79° 11′ W. Barometer, 30.48; temperature of air, 36°; of water, 40°. Winds: S. W. by W., S. S. W. to W. by S.; calm. First part, light breezes and light squally weather; middle, baffling; ends, calm and foggy.

Sept. 9. Lat. 53° 34′ S.; long. 83° 00′ W. Barometer, 29.96; temperature of air, 38°; of water, 40°. Winds: calm, N. E., N. W. by N. Commences, calm and foggy; middle and latter parts, fine breezes.

Sept. 10. Lat. 53° 11′ S.; long. 85° 28′ W. Barometer, 29.08; temperature of air, 40°; of water, 41°. Winds: N. W. by N., W. by S., W.; strong breezes and strong gales, and cloudy squally weather.

Sept. 11. Lat. 50° 26′ S.; long. 85° 48′ W. Barometer, 29.46; temperature of air, 40°; of water, 41°. Winds: W. N. W., S. W., S. W. by W. Commences, strong breezes and squally, with rain; 9 P. M. wind hauled to S. W.; middle and latter parts, strong breezes and squally, with a heavy cross sea.

Ship Eagle (John S. Farron), New York to San Francisco, 62 days out.

Sept. 10, 1851. Lat. 48° 38′ S.; long. 49° 35′ W. Current, N. 66° E., 20 miles. Barometer, 29.28; temperature of air, 42°; of water, 46°. Winds: S. W. by S., S. W. by W., S. W. by W. First and second parts, fresh; latter, hard gales and cloudy.

Sept. 11. Lat. 50° 31′ S.; long. 51° 10′ W. Current, N. 80° E., 22 miles. Barometer, 28.93; temperature of air, 42°; of water, 38°. Winds: W. by S., W. by N., W. N. W.; strong gales, cloudy and rain.

Sept. 12. Lat. 51° 20′ S.; long. 51° 06′ W. Current, E., 20 miles. Barometer, 29.20; temperature of air, 40°; of water, 38°. Winds: W. by N., W., W.; heavy gales, hail and lightning.

Sept. 13. Lat. 52° 20′ S.; long. 51° 41′ W. Current, S. 81° E., 24 miles. Barometer, 29.38; temperature of air, 41°; of water, 37°. Winds: W. S. W., S. W., W. by N. First part, strong gale; second and third parts, moderate.

Sept. 14. Lat. 54° 01′ S.; long. 54° 46′ W. Current, S. 83° E., 26 miles. Barometer, 29.09; temperature of air, 41°; of water, 39°. Winds: W. by N., W. N. W., W. by N.; moderate, cloudy and hazy.

Sept. 15. Lat. 55° 05′ S.; long. 59° 42′ W. Current, S. 80° E., 20 miles. Barometer, 29.03; temperature of air, 34°; of water, 39°. Winds: E. S. E., E., S.; moderate breezes, with sleet of snow.

Sept. 16. Lat. 53° 00′ S.; long. 60° 53′ W. Current, S. 86° E., 25 miles. Barometer, 29.64; temperature of air, 32°; of water, 39°. Winds: S. W. by S., S. W. by S., S. S. W. Heavy squalls of sleet and snow; latter, passing clouds.

Sept. 17. Lat. 55° 07′ S.; long. 62° 56′ W. Current, E., 32 miles. Barometer, 29.85; temperature of air, 43°; of water, 39°. Winds: S., S. W., W. N. W. Moderate and cloudy.

Sept. 18. Lat. 56° 58′ S.; long. 67° 23′ W. Current, S., 25 miles. Barometer, 29.28; temperature of air, 43°; of water, 40°. Winds: N. N. W., W. N. W., W. N. W. First, moderate; second, variable; third, fresh gales, and cloudy.

Sept. 19. Lat. 58° 21′ S.; long. 69° 5′ W. Barometer, 29.62; temperature of air, 42°; of water, 39°. Winds: W., W. by S., W. by N. Strong breezes, and cloudy.

Sept. 20. Lat. 59° 38′ S.; long. 71° 33′ W. Barometer, 29.48; temperature of air, 39°; of water, 39°. Winds: W. N. W., W. N. W., W. Hard squalls and hail; latter, fair.

Sept. 21. Lat. 61° 07′ S.; long. 73° 30′ W. Barometer, 29.45; temperature of air, 38°; of water, 36°. Winds: W., W. by S., W. Moderate, and thick drizzling rain.

Sept. 22. Lat. 61° 48′ S.; long. 76° 36′ W. Barometer, 28.65; temperature of air, 37°; of water, 34°. Winds: W. N. W., N. W., N. W. by W. Moderate, cloudy, and rainy.

Sept. 23. Lat. 60° 59′ S.; long. 76° 50′ W. Current, N. 82° E., 16 miles. Barometer, 28.70; temperature of air, 36°; of water, 36°. Winds: W. S. W., E. S. E., W. N. W. First, light, with snow; latter, cloudy.

Sept. 24. Lat. 59° 45′ S.; long. 78° 50′ W. Barometer, 28.42; temperature of air, 37°; of water, 38°. Winds: W. by N., N. W., N. N. W. Moderate and cloudy, with drizzling rain.

Sept. 25. Lat. 59° 16′ S.; long. 80° 47′ W. Barometer, 28.30; temperature of air, 39°; of water, 37°. Winds: N. N. W., calm, S. S. W. First and second, drizzling; third, snow.

Sept. 26. Lat. 56° 14′ S.; long. 83° 1′ W. Barometer, 29.03; temperature of air, 32°; of water, 39°. Winds: S. W. by W., S. E., S. E. by S. First, baffling, with snow squalls; second, snow; third, cloudy.

Sept. 27. Lat. 52° 50′ S.; long. 84° 45′ W. Barometer, 28.80; temperature of air, 36°; of water, 40°. Winds: S. E. throughout. Fresh breezes; dark cloudy weather, with heavy snow squalls.

Sept. 28. Lat. 50° 00′ S.; long. 85° 16′ W. Barometer, 29.25; temperature of air, 40°; of water, 42°. Winds: S. E., S., S. E. First and second, baffling and fair; latter, rain.

Barque Sarah H. Snow (Laban Hawes), Boston to Valparaiso, 38 days from Cape St. Roque.

Sept. 11, 1851. Lat. 49° 46′ S.; long. 65° 00′ W. Barometer, 29.40; temperature of air, 46°; of water, 42°. Winds: W. S. W., W., and W. S. W. Strong breezes and clear weather.

Sept. 12. Lat. 51° 30′ S.; long. 64° 59′ W. Barometer, 29.60; temperature of air, 44°; of water 42°. Winds: W. S. W., S. W., and W. S. W. Fresh breezes and passing clouds.

Sept. 13. Lat. 54° 33′ S.; long. 65° 12′ W. Barometer, broke; temperature of air, 46°; of water, 42°. Winds: W. N. W., N. W., and W. N. W. Strong gales, with quick passing clouds; made Cape St. Diego, bearing S. E.

Sept. 14. Lat. 55° 45′ S.; long. 65° 39′ W. Temperature of air, 40°; of water, 42°. Winds: W. N. W., calm, and S. E. Weather variable; passed through the Straits of Le Maire.

Sept. 15. Lat. 56° 37′ S.; long. 64° 56′ W. Temperature of air, 37°; of water, 42°. Winds: S. E., S. by E., and S. W. by S. Hard gales, with snow.

Sept. 16. Lat. 56° 45′ S.; long. 65° 00′ W. Temperature of air, 35°; of water, 42°. Winds: S. S. W., S. S. W., and variable. First and middle parts, blowing hard, with snow; ends fair.

Sept. 17. Lat. 57° 20′ S.; long. 65° 50′ W. Temperature of air, 42°; of water, 41°. Winds: variable, variable, and W. N. W. Moderate breezes and squally; latter part, fresh and squally.

Sept. 18. Lat. 57° 46′ S.; long. 69° 33′ W. Temperature of air, 42°; of water, 40°. Wind: W. N. W. Fresh breezes and hard gales, with rain.

Sept. 19. Lat. 58° 50′ S.; long. 70° 50′ W. Temperature of air, 42°; of water, 40°. Winds: W., W. S. W., and W. Blowing hard, with squalls and high sea.

Sept. 20. Lat. 59° 50′ S.; long. 71° 47′ W. Temperature of air, 39°; of water, 40°. Wind: W. Hard gales, with squalls, and rain, and snow.

Sept. 21. Lat. 59° 50′ S.; long. 72° 00′ W. Temperature of air, 40°; of water, 40°. Wind: W. Dull, rainy weather; blowing hard.

Sept. 22. Lat. 60° 27′ S.; long. 72° 58′ W. Current, E. 24 miles. Temperature of air, 39°; of water, 37°. Wind: W. N. W. Blowing hard, cloudy and rainy.

Sept. 23. Lat. 60° 26′ S.; long. 73° 00′ W. Temperature of air, 40°; of water, 37°. Winds: W. Strong gales, with rain and heavy sea.

Sept. 24. Lat. 59° 50′ S.; long. 74° 00′ W. Temperature of air, 38°; of water, 38°. Winds: W., W., and S. W. Fresh breezes, and light squalls of rain and snow.

Sept. 25. Lat. 59° 41′ S.; long. 76° 30′ W. Temperature of air, 40°; of water, 39°. Winds: N. W., N. W. by W., and variable. Strong breezes and squally, with snow and rain.

Sept. 26. Lat. 57° 31′ S.; long. 77° 35′ W. Temperature of air, 38°; of water, 40°. Winds: S. W., S. W., and S. S. W. Fresh winds, with hail and snow squalls.

Sept. 27. Lat. 55° 02′ S.; long. 79° 41′ W. Temperature of air, 39°; of water, 40°. Winds: S., S. S. E., and S. E. by E. Strong breeze, with dark clouds; hail and snow.

Sept. 28. Lat. 52° 00′ S.; long. 81° 25′ W. Temperature of air, 38°; of water, 42°. Winds: S. E., S., and S. S. W. Fresh winds and squally, with rain and snow.

Sept. 29. Lat. 50° 10′ S.; long. 81° 45′ W. Temperature of air, 42°; of water, 42°. Winds: S. W., S. W. by W., and N. N. E. First part, snow and hail squalls; latter part, fresh gale and rain.

Ship Raven (W. H. Henry), New York to San Francisco, 19 days from Cape St. Roque.

Sept. 23. Lat. 50° 51′ S.; long. 65° 20′ W. Current, E., 20 miles. Barometer, 29.70; temperature of air, 40°; of water, 40°. Winds: W. S. W., calm, E. S. E.; light airs and calm.

Sept. 24. Lat. 51° 46′ S.; long. 64° 31′ W. Current, N. E. ½ E., 23 miles. Barometer, 29.80; temperature of air, 38°; of water, 40°. Winds: S. E., S., and S. S. E. Moderate breeze and squally.

Sept. 25. Lat. 52° 53′ S.; long. 66° 10′ W. Current, N., 14 miles. Barometer, 29.80; temperature of air, 36°; of water, 40°. Winds: S. E., baffling, E. S. E., light and variable.

Sept. 26. Lat. 54° 26′ S.; long. 65° 10′ W. Current, E., 24 miles. Barometer, 29.60; temperature of air, 38°; of water, 40°. Winds: N. N. E., light and variable; made the land of Terra del Fuego; at noon, Cape St. Diego bore S. by E., 12 miles.

Sept. 27. Lat. 55° 58′ S.; long. 69° 05′ W. Current, E., 24 miles. Barometer, 29.50; temperature of air, 42°; of water, 42°. Wind: N. W. Moderate and cloudy; passed through the Straits of Le Maire, and cleared them at 6 A. M.; at 5 A. M., Cape Horn bore N. N. W., 2 miles.

Sept. 28. Lat. 56° 14′ S.; long. 71° 05′ W. Current, none. Barometer, 29.50. Winds: calm and W. N. W., light and calm.

Sept. 29. Lat. 55° 45′ S.; long. 73° 00′ W. Current, E., 36 miles. Barometer, 29.70; temperature of air, 40°; of water, 40°. Winds: W., S. S. W., and W. S. W. Fresh breezes and squally, with rain.

Sept. 30. Lat. 55° 38′ S.; long. 74° 35′ W. Barometer, 29.70; temperature of air, 40°; of water, 40°. Wind: W. Fresh gales and thick cloudy weather; *double reefs.*

Oct. 1. Lat. 56° 03′ S.; long. 75° 24′ W. Barometer, 29.20; temperature of air, 40°; of water, 40°. Wind: W. N. W. Heavy gales and violent squalls, with rain.

Oct. 2. Lat. 55° 57′ S.; long. 74° 35′ W. Current, in three days, E., 88 miles. Barometer, 29.40; temperature of air, 41°; of water, 41°. Winds: W. N. W., W. S. W., and S. W. Hard gales and squalls.

Oct. 3. Lat. 55° 32′ S.; long. 74° 35′ W. Current, E., 30 miles. Barometer, 29.40; temperature of air, 40°; of water, 41°. Winds: W., and W. N. W. Strong gales and hard squalls; turbulent sea.

Oct. 4. Lat. 55° 36′ S.; long. 74° 45′ W. Barometer, 28.70; temperature of air, 41°; of water, 41°. Winds: W., and W. N. W. Strong gales and violent squalls, with rain.

Oct. 5. Lat. 55° 26′ S.; long. 75° 45′ W. Barometer, 28.50; temperature of air and water, 41°. Winds: W. N. W., W., W. S. W. Heavy gales.

Oct. 6. Lat. 53° 47′ S.; long. 75° 20′ W. Barometer, 29.70; temperature of air, 46°; of water, 45°. Wind: W. Light winds and passing squalls, with rain.

Oct. 7. Lat. 54° 03′ S.; long. 78° 21′ W. Current, E., 12 miles. Barometer, 29.60; temperature of air, 46°; of water, 46°. Winds: N. W., N. N. W., and N. W. First part, light; latter part, fresh breezes.

Oct. 8. Lat. 54° 25′ S.; long. 80° 18′ W. Barometer, 29.70; temperature of air, 43°; of water, 42°. Wind: N. W. Strong gales, and thick rainy weather.

Oct. 9. Lat. 54° 04′ S.; long. 83° 25′ W. Barometer, 29.50; temperature of air, 43°; of water, 43°. Winds: W., N. W., and N. N. W. Strong breezes, and thick rainy weather.

Oct. 10. Lat. 53° 10′ S.; long. 82° 40′ W. Current, E., 12 miles. Barometer, 29.50; temperature of air, 42°; of water, 43°. Winds: W., calm, and N. W. Variable breezes, and thick weather.

Oct. 11. Lat. 50° 55′ S.; long. 79° 10′ W. Current, E., 18 miles. Barometer, 29.70; temperature of air, 42°; of water, 42°. Wind: N. W. Moderate breeze, and cloudy.

Oct. 12. Lat. 50° 02′ S.; long. 80° 18′ W. Barometer, 29.70; temperature of air, 44°; of water, 45°. Winds: W. N. W., N. N. W., and N. N. W. Variable breezes, and thick weather.

Ship Samuel Russell (Joseph Limeburner), from New York to San Francisco, 26 days from Cape St. Roque.

Oct. 8, 1852. Lat. 51° 18′ S.; long. 64° 00′ W. Barometer, 30.30; temperature of air, 54°. Winds: E. N. E., N., and N. N. W. Fresh breezes and calms; thick and foggy.

Oct. 9. Lat. 55° 46′ S.; long. 65° 03′ W. Barometer, 30.29; temperature of air, 52°. Winds: N. W., S. W. by W., and calm. Foggy weather.

Oct. 10. Lat. 55° 00′ S.; long. 63° 43′ W. Barometer, 30.10; temperature of air, 46°. Winds: calm, N., and N. W. First part, light breeze and thick fog; latter part, clear.

Oct. 11. Lat. 56° 22′ S.; long. 67° 50′ W. Barometer, 30.10; temperature of air, 42°. Winds: W. S. W., baffling. Strong breezes and snow squalls.

Oct. 12. Lat. 56° 35′ S.; long. 67° 50′ W. Barometer, 30.10; temperature of air, 42°. Winds: W. S. W., baffling. Light breezes and thick weather.

Oct. 13. Lat. 56° 49′ S.; long. 71° 40′ W. Barometer, 29.65; temperature of air, 46°. Winds: N. E., N., and N. W. First part, light; latter part, strong breezes.

Oct. 14. Lat. 57° 34′ S.; long. 73° 59′ W. Barometer, 29.50; temperature of air, 40°; of water, 54°. Winds: N. W., W., W. N. W. Strong gales and rain during first part; latter part, clear.

Oct 15. Lat. 57° 12′ S.; long. 75° 13′ W. Barometer, 29.90; temperature of air, 40°. Winds: W. by N., S. W., and W. N. W. Heavy gales, and squally.

Oct. 16. Lat. 57° 33′ S.; long. 77° 50′ W. Barometer, 29.70; temperature of air, 42°. Winds: N. W. by W., N. W., and N. W. Strong gales, and heavy sea.

Oct. 17. Lat. 57° 10′ S.; long. 79° 12′ W. Barometer, 29.70; temperature of air, 38°. Winds: W. N. W., W., and W. by S. Strong breezes and clear.

Oct. 18. Lat. 54° 34′ S.; long. 78° 12′ W. Barometer, 29.75; temperature of air, 40°. Winds: W. N. W., W., and W. Heavy gale and squalls.

Oct. 19. Lat. 52° 02′ S.; long. 77° 29′ W. Barometer, 29.80; temperature of air, 43°. Winds: W., W. S. W., and N. W. by W. Strong breezes and thick weather; heavy head sea.

Oct. 20. Lat. 52° 45′ S.; long. 78° 31′ W. Barometer, 29.00; temperature of air, 42°. Winds: W. S. W., W., and S. by W. Heavy gales and heavy head sea.

Oct. 21. Lat. 52° 30′ S.; long. 78° 50′ W. Barometer, 29.50; temperature of air, 46°. Winds: S. S. W., W. S. W., and N. W. Strong gale, and hail squalls.

Oct. 22. Lat. 52° 37′ S.; long. 77° 49′ W. Barometer, 29.10; temperature of air, 40°. Wind: W. Strong gales and hail squalls.

Oct. 23. Lat. 50° 44′ S.; long. 79° 18′ W. Barometer, 29.00; temperature of air, 40°. Winds: W. by S., W. S. W., and S. W. Strong gales and rainy.

Ship Winged Arrow (F. Bearre), Boston to San Francisco, 21 days from St. Roque.

Sept. 25. Lat. 50° 05′ S.; long. 66° 41′ W. Barometer, 29.5; temperature of air, 56°; of water, 55°. Winds: S. E., calm, variable. Light airs and calms.

Sept. 26. Lat. 52° 30′ S.; long. 67° 00′ W. Barometer, 29.5; temperature of air, 56°; of water, 55°. Winds: S. E. throughout. Light breezes and cloudy weather.

Sept. 27. Lat. 55° 00′ S.; long. 64° 15′ W. Barometer, 29.5; temperature of air, 56°; of water, 55°. Winds: N. E., N. E., N. First and second parts, moderate; third, fresh breezes.

Sept. 28. Lat. 56° 30′ S.; long. 67° 30′ W. Barometer, 29.5; temperature of air, 56°; of water, 55°. Winds: N., N., N. W. Moderate and pleasant.

Sept. 29. Lat. 56° 40′ S.; long. 69° 14′ W. Barometer, 28.7; temperature of air, 56°. Winds: W., S. S. W., W. S. W. Fresh gales and heavy squalls.

Sept. 30. Lat. 57° 15′ S.; long. 70° 15′ W. Barometer, 28.6; temperature of air, 50°. Wind: W., S. W., S. W. by W., W. S. W. Fresh gales and variable weather.

Oct. 1. Lat. 57° 20′ S.; long. 71° 00′ W. Barometer, 28.8. Winds: W., W. by N., W. by N. Heavy gales.

Oct. 2. Lat. 57° 33′ S.; long. 70° 42′ W. Barometer, 28.8. Winds: W., W., S. S. W. Heavy gales.

Oct. 3. Lat. 57° 52′ S.; long. 71° 51′ W. Barometer, 28.8. Winds: W., W., W. by S. Heavy gales and rain.

Oct. 4. Lat. 58° 00′ S.; long. 71° 50′ W. Barometer, 28.9. Winds: W. by N. throughout; heavy gales, with constant rain and snow.

Oct. 5. Lat. 56° 12′ S.; long. 71° 36′ W. Barometer, 29.0. Winds: W. by S., W. by S., W.; fresh gales; third part, more moderate.

Oct. 6. Lat. 55° 40′ S.; long. 72° 03′ W. Barometer, 29.7. Winds: W. by S. throughout; squally and variable.

Oct. 7. Lat. 57° 03′ S.; long. 74° 19′ W. Barometer, 29.6. Winds: W., W. N. W., N. W. First and second parts, moderate; third part, fresh.

Oct. 8. Lat. 57° 50′ S.; long. 74° 30′ W. Barometer, 29.3. Winds: W. N. W. throughout; fresh gales and rainy.

Oct. 9. Lat. 57° 30′ S.; long. 76° 30′ W. Barometer, 29.3. Winds: W. by N., W. by N., N. N. W.; moderate and rainy.

Oct. 10. Lat. 56° 13′ S.; long. 78° 39′ W. Barometer, 29.6. Winds: N. N. W., W.; variable, moderate and foggy.

Oct. 11. Lat. 56° 43′ S.; long. 79° 57′ W. Barometer, 29.4. Winds: N. W., W. N. W., W. by S.; moderate breezes.

Oct. 12. Lat. 56° 30′ S., long. 82° 10′ W. Barometer, 29.3. Winds: W. S. W., calm, N. First part, moderate; second part, calm; third part, gales.

Oct. 13. Lat. 55° 13′ S.; long. 84° 10′ W. Barometer, 29.02. Winds: W. N. W., W. N. W., W. by N.; fresh gales and rain.

Oct. 14. Lat. 52° 19′ S.; long. 83° 03′ W. Barometer, 29.5. Winds: W., W., W. by S.; fresh breezes and light squalls of rain.

Oct. 15. Lat. 48° 43′ S.; long. 83° 37′ W. Barometer, 29.8. Winds: W., throughout; fine breezes and clear pleasant weather.

Ship Louis Philippe (Robert Benthall), Baltimore to Valparaiso, 30 days from St. Roque.

Sept. 29, 1849. Lat. 50° 00′ S.; long. 63° 02′ W. Current, N. 56° E., 0.6 mile per hour; temperature of air, 43°; of water, 41°. Barometer, 30.05. Winds: W., S. W., S. W.; moderate breezes and pleasant.

Sept. 30. Lat. 51° 54′ S.; long. 63° 20′ W. Current, N. 45° E., 0.5 mile per hour; temperature of air, 42°; of water, 40°. Barometer, 29.92. Winds: W. S.W., W. S. W., W.; moderate and clear.

Oct. 1. Lat. 53° 18′ S.; long. 63° 54′ W. Current, N. 78° E., 1 mile per hour. Barometer, 29.8. Winds: W., W. S. W. to W.; variable light breezes and clear.

Oct. 2. Lat. 54° 52′ S.; long. 65° 14′ W. Current, S. 74° E., 1.7 mile per hour; temperature of air, 43°; of water, 41°. Barometer, 29.47. Winds: N., W. N. W. to N. W., N. W. to variable; light breezes, cloudy and rainy. Passed through the Straits of Le Maire; strong tide rips.

Oct. 3. Lat. 56° 29′ S.; long. 65° 55′ W. Current, N. 19° E., 0.6 mile per hour; temperature of air, 42°; of water, 38°. Barometer, 29.35. Winds: W. throughout; moderate breezes and rainy.

Oct. 4. Lat. 57° 29′ S.; long. 66° 42′ W. Current, N. 19° E., 0.6 mile per hour; temperature of air, 39°; of water, 38°. Barometer, 29.34. Winds: W., W. to W. N. W., W. N. W. to W.; cloudy, with hard snow squalls, moderate breezes.

Oct. 5. Lat. 56° 20′ S.; long. 66° 19′ W. Current, S. 77° E., 1 mile; temperature of air, 42°; of water, 38°. Barometer, 29.62. Winds: S. W. to W. S. W., W. S. W., W. N. W.; cloudy, with hail squalls, moderate breezes.

Oct. 6. Lat. 55° 08′ S.; long. 70° 40′ W. Current, S. 57° E., 1.5 mile per hour; temperature of air, 46°; of water, 40°. Barometer, 29.20. Winds: N. W. and S. W., N. W. by N., N. by W.; moderate breezes, and cloudy with rain.

Oct. 7. Lat. 57° 07′ S.; long. 70° 50′ W. Current, N. 57° E., 1.5 mile per hour. Temperature of air, 40°; of water, 38°. Barometer, 28.82. Winds: N. by E. to N. W., W. N. W., W. N. W.; strong breezes and snow squalls.

Oct. 8. Lat. 57° 18′ S.; long. 71° 42′ W. Current, N. 64° E., 1 mile per hour. Temperature of air, 39°; of water, 38°. Barometer, 28.70. Winds: N. W. to W. N. W., W. N. W., S. E. to S. W., W. N. W.; strong winds, and hard snow squalls.

Oct. 9. Lat. 57° 25′ S.; long. 71° 43′ W. Current, N. 26° E., 0.7 mile per hour. Temperature of air, 40°; of water, 41°. Barometer, 28.97. Winds: W. N. W., W., S. W. to S. S. W. First part, moderate gales and snow squalls; second and third parts, moderating.

Oct. 10. Lat. 56° 50′ S.; long. 72° 40′ W. Current, N. 69° W., 0.7 mile per hour. Temperature of air, 40°; of water, 41°. Barometer, 29.42. Winds: S. W., S. W. to W. S. W., W.; moderate and cloudy, with snow and hail.

Oct. 11. Lat. 58° 00′ S.; long. 74° 54′ W. Current, N. 76° W., 0.7 mile per hour. Temperature of air, 38°; of water, 39°. Barometer, 28.97. Winds: W. N. W., W. N. W. to N. W., W. to W. N. W.; moderate and cloudy, with rain.

Oct. 12. Lat. 58° 21′ S.; long. 77° 09′ W. Current, S. 74° W., 1.3 mile per hour. Temperature of air, 40°; of water, 39°. Barometer, 28.45. Winds: N. N. W., N. N. W. to W. N. W., W. N. W. First part, moderate and cloudy; second and third parts, light breeze and rain.

Oct. 13. Lat. 56° 31′ S.; long. 77° 04′ W. Current, S. 13° E., 0.5 mile per hour. Temperature of air, 37°; of water, 40°. Barometer, 28.82. Winds: S. W. to W. N. W., W. S. W. to W. by N., W. S. W. to W. by N.; moderate breezes, with snow squalls.

Oct. 14. Lat. 54° 42′ S.; long. 76° 31′ W. Current, S. 49° E., 0.5 mile per hour. Temperature of air, 40°; of water, 39°. Barometer, 29.17. Winds: W. to W. S. W., W. to W. S. W., W., W. N. W.; moderate breezes, with snow squalls.

Oct. 15. Lat. 55° 26′ S.; long. 76° 53′ W. Temperature of air, 43°; of water, 42°. Barometer, 22.82. Winds: W. to W. S. W., W. S. W. to W. N. W., W. N. W.; strong winds and cloudy, with rain.

Oct. 16. Lat. 55° 24′ S.; long. 77° 27′ W. Temperature of air, 37°; of water, 39°. Barometer, 28.94. Winds: W. N. W., W., W. S. W. First part, moderate and cloudy, with snow squalls; second part, moderate and rainy; third part, moderate, with snow and rain.

Oct. 17. Lat. 55° 20′ S.; long. 77° 47′ W. Current, S. 39° E., 0.6 mile per hour. Barometer, 28.82;

Winds: S. W. to W. S. W., W. to W. N. W., W. N. W. to N. by W. First and second parts, moderate and clear; third part, stormy, with rain.

Oct. 18. Lat. 55° 34′ S.; long. 77° 25′ W. Current, S. 39° E., 0.6 mile per hour. Temperature of air, 40°; of water 39°. Barometer, 28.67. Winds: N. W. to W. N. W., W. N. W., W.; stormy weather, with snow squalls.

Oct. 19. Lat. 55° 28′ S.; long. 77° 17′ W. Current, S. 46° E., 1 mile. Temperature of air, 40°; of water, 39°. Barometer, 29.18. Winds: W., W. S. W.; cloudy, and fresh breezes, with snow squalls.

Oct. 20. Lat. 52° 50′ S.; long. 78° 15′ W. Current, S. 46° E., 1 mile. Temperature of air, 40°; of water, 40°. Barometer, 29.52. Winds: S. W., S. W. by W.; S. W. by W.; fresh breezes and cloudy, with snow, rain, and hail.

Oct. 21. Lat. 50° 10′ S.; long. 79° 53′ W. Current, S. 42° E., 0.5 mile per hour. Temperature of air, 43°; of water, 43°. Barometer, 30.17. Winds: S. W. to S. S. W., S., S. S. E. to S. S. W.; moderate, with passing clouds and light hail.

Schooner Clifton (Daggett), New York to Acapulco, from Cape St. Roque, 32 days.

Sept. 26. Lat. 50° 31′ S.; long. 64° 27′ W. Barometer, 28.48; temperature of air, 44°; of water, 42°. Winds: W. by N., N. N. E. and N. Strong breeze.

Sept. 27. Lat. 51° 57′ S.; long. 64° 27′ W. Barometer, 28.48; temperature of air, 46°; of water, 41°. Winds: N. N. W., N. N. E., and N. Misty and cloudy.

Sept. 28. Lat. 53° 40′ S.; long. 64° 28′ W. Barometer, 28.25; temperature of air, 44°; of water, 44°. Winds: N. W., S. W., and S. W. Strong breezes and passing squalls.

Sept. 29. Lat. 54° 08′ S.; long. 63° 42′ W. Temperature of air, 40°; of water, 42°. Barometer, 28.94. Winds: W. S. W., S. W., and S. W. Snow squalls and strong breezes; saw Staten Land.

Sept. 30. Lat. 54° 54′ S.; long. 63° 28′ W. Barometer, 29.25; temperature of air, 44°; of water, 42°. Winds: N., N. E., and N. E. Fair weather; saw Cape St. John.

Oct. 1. Lat. 56° 32′ S.; long. 66° 00′ W. Barometer, 28.65; temperature of air, 40°; of water, 41°. Winds: W. by S., W. S. W., and W. S. W. Squally.

Oct. 2. Lat. 56° 55′ S.; long. 65° 48′ W. Barometer, 28.85; temperature of air, 42°; of water, 39°. Winds: W. N. W., N. N. W., and N. N. W. Some rain; wind strong.

Oct. 3. Lat. 57° 13′ S.; long. 66° 37′ W. Barometer, 28.85; temperature of air, 41°; of water, 39°. Winds: N., N. N. W. and N. Squally; an occasional blue sky.

Oct. 4. Lat. 57° 22′ S.; long. 67° 31′ W. Barometer, 28.87; temperature of air, 44°; of water, 41°. Winds: N., E., and E. N. E. Cloudy and misty; light wind.

Oct. 5. Lat. 56° 57′ S.; long. 70° 30′ W. Barometer, 28.30; temperature of air, 46°; of water, 44°. Winds: N. E., N. E., and S. W. Snow squalls.

Oct. 6. Lat. 57° 05′ S.; long. 71° 13′ W. Barometer, 29.68; temperature of air, 40°; of water, 43°. Winds: W. N. W., N., and W. N. W. Strong winds, and snow squall.

Oct. 7. Lat. 57° 20′ S.; long. 73° 19′ W. Barometer, 28.80; temperature of air, 41°; of water, 40°. Winds: N. by W., N., and N. E. Moderate breezes and rain.

Oct. 8. Lat. 56° 52′ S.; long. 76° 50′ W. Barometer, 28.57; temperature of air, 44°; of water, 41°. Winds: N. W., S. W., and W. S. W. Cloudy, light winds.

Oct. 9. Lat. 56° 10′ S.; long. 79° 17′ W. Barometer, 29.27; temperature of air, 43°; of water, 42°. Winds: S. E., S. E., and S. S. E. Cloudy; fresh winds.

Oct. 10. Lat. 54° 29′ S.; long. 81° 49′ W. Barometer, 29.60; temperature of air, 40°; of water, 41°. Winds: S. W., S. W., and W. N. W. Cloudy and rainy; light winds.

Oct. 11. Lat. 52° 20′ S.; long. 82° 14′ W. Barometer, 29.60; temperature of air, 43°; of water, 42°. Winds: W., W. N. W., W. Cloudy; fresh winds with rain.

Oct. 12. Lat. 50° 21′ S.; long. 82° 25′ W. Barometer, 29.65; temperature of air, 43°; of water, 43°. Winds: W., W., W. by N. Some rain.

Ship Sea Witch (George W. Fraser), New York to San Francisco, 21 days from St. Roque.

Oct. 14, 1852. Lat. 51° 43′ S.; long. 64° 40′ W. Temperature of air, 50°; of water, 42°. Winds: N. N. E., N., N. W. First and second parts, fresh and foggy; third part, light airs.

Oct. 15. Lat. 52° 51′ S.; long. 63° 40′ W. Temperature of air, 48°; of water, 42°. Winds: S. W., S. E., E. S. E. First and second parts, fresh breezes; third part, moderate.

Oct. 16. Lat. 54° 15′ S.; long. 64° 46′ W. Barometer, 29.47; temperature of air, 48°; of water, 41°. Winds: S. E., calm, W. First part, moderate; second part, calm; third part, light breezes.

Oct. 17. Lat. 55° 33′ S.; long. 66° 40′ W. Barometer, 29.25; temperature of air, 46°; of water, 42°. Winds: W., calm, W. S. W. First and second parts, light breezes; third part, calm.

Oct. 18. Lat. 56° 30′ S.; long. 67° 16′ W. Barometer, 29.02; temperature of air, 46°; of water, 42°. Winds: W. S. W., W., W. N. W. First part, light airs; second part, fresh gales; third part, heavy gales.

Oct. 19. Lat. 56° 02′ S.; long. 67° 12′ W. Barometer, 28.70; temperature of air, 42°; of water, 42°. Winds: W. N. W., W. S. W., W. S. W. Hard gales; third part, moderate.

Oct. 20. Lat. 56° 30′ S.; long. 69° 8′ W. Barometer, 28.35; temperature of air, 44°; of water, 42°. Winds: W. N. W., N. N. W., W. N. W. Heavy gales.

Oct. 21. Lat. 56° 15′ S.; long. 70° 56′ W. Barometer, 28.3; temperature of air, 41°; of water, 40°. Winds: W. N. W., S., N. N. W. Hard gales, with squalls of rain, hail, and snow.

Oct. 22. Lat. 57° 12′ S.; long. 71° 44′ W. Barometer, 28.22; temperature of air, 39°; of water, 40°. Winds: W. N. W throughout. Hard gales, with gales of hail and snow.

Oct. 23. Lat. 56° 23′ S.; long. 72° 18′ W. Barometer, 28.12; temperature of air, 38°; of water, 39°. Winds: W. S. W., W. S. W., calm. First and second parts, hard gales; third part calm.

Oct. 24. Lat. 55° 22′ S.; long 73° 25′ W. Barometer, 27.89; temperature of air, 40°; of water, 40°.

Winds: W. S. W., W. S. W., calm and E. First part, fresh; second part heavy gales; third part, calms and light airs.

Oct. 25. Lat. 54° 49′ S.; long. 77° 29′ W. Barometer, 27.97; temperature of air, 40°; of water, 42°. Winds: E., N. W., S. W. Hard gales and rain.

Oct. 26. Lat. 54° 18′ S.; long. 78° 47′ W. Barometer, 28.15; temperature of air, 44°; of water, 43°. Winds: S. W., N. N. W., N. W. Hard gales and cloudy.

Oct. 27. Lat. 52° 29′ S.; long. 79° 24′ W. Barometer, 28.50; temperature of air, 44°; of water, 44°. Winds: W., W. S. W., W. Fresh gales and squally.

Oct. 28. Lat. 51° 41′ S.; long. 80° 15′ W. Barometer, 28.43; temperature of air, 44°; of water, 43°. Winds: W. N. W., W. N. W., W. Fresh gales and squally.

Oct. 29. Lat. 49° 47′ S.; long. 79° 5′ W. Barometer, 29.10; temperature of air, 45°; of water, 44°. Winds: W. by N., W. by N., W. N. W. Fresh gales and squally weather.

Thomas W. Sears (Joseph Osgood), New York to San Francisco, 75 days out.

Nov. 1. Lat. 49° 32′ S.; long. 65° 27′ W. Current, N. 35° E., 1.1 knot per hour. Barometer, 29.74; temperature of air, 48°; of water, 44°. Winds: N., N. N. W., S. First and middle parts, fresh gales; ends pleasant breeze.

Nov. 2. Lat. 50° 50′ S.; long. 65° 04′ W. Barometer, 29.86; temperature of air, 46°; of water, 43°. Winds: E., N. E., S. Light winds throughout.

Nov. 3. Lat. 51° 36′ S.; long. 64° 57′ W. Current, N. 31° E., 0.3 knot per hour. Barometer, 29.90; temperature of air, 50°; of water, 44°. Winds: S. S. W., calm, E. by S. Light airs and calms this day.

Nov. 4. Lat. 52° 55′ S.; long. 65° 13′ W. Current, S. 53° W., 0.6 knot per hour. Barometer, 29.79; temperature of air, 50°; of water 47°. Winds: E. N. E., E. N. E., E. S. E. Light airs and pleasant throughout.

Nov. 5. Lat. 53° 34′ S.; long. 65° 58′ W. Current, N. 20° W., 0.8 knot per hour. Barometer, 29.35; temperature of air, 47°; of water, 46°. Winds: E., E., S. Light airs and pleasant throughout.

Nov. 6. Lat. 54° 15′ S.; long. 64° 35′ W. Current, N. 58° W., 30 miles. Barometer, 29.40; temperature of air, 52°; of water, 44°. Winds: S. E. by S., calm, N. W. First and middle parts, light airs and calm; latter, fine breeze. At 8 hours 30 min. A. M. saw Cape St. Vincent bearing south, distant 40 miles.

Nov. 7. Lat. 56° 16′ S.; long. 65° 55′ W. Current, S. 44° W., 27 miles. Barometer, 29.08; temperature of air, 47°; of water, 44°. Winds: N. W., N. W., N. W. by N. Strong breezes. At 6 P. M. Cape St. John bore west. Land in sight in the morning.

Nov. 8. Lat. 56° 55′ S.; long. 65° 18′ W. Barometer, 29.20; temperature of air, 41°; of water 43°. Winds: W. S. W. throughout. Hard gale, with rain, snow, and hail. An ugly sea.

Nov. 9. Lat. 57° 09′ S.; long. 67° 57′ W. Barometer, 28.90; temperature of air, 44°; of water, 43°. Winds: W. S. W., N. W., N. W. Commences moderating. Morning, light and baffling airs.

Nov. 10. Lat. 57° 23′ S. (D. R.); long. 67° 12′ W. (D. R.). Strong easterly current. Barometer, 28.50; temperature of air, 39°; of water, 41°. Winds: calm, W., N. N. W. At 6 P. M. looking bad to the westward. At 10 A. M. hard gales, with hail, rain, and snow. Ends hard gales.

Nov. 11. Lat. 57° 38′ S.; long. 66° 00′ W. Current, strong easterly. Barometer, 28.57; temperature of air, 42°; of water, 41°. Winds: S. W., S. W., W. S. W. Heavy gales. During the forenoon a snow storm.

Nov. 12. Lat. 58° 07′ S.; long. 65° 27′ W. Barometer, 28.80; temperature of air, 38°; of water, 40°. Winds: W. S. W., S. W., S. W. Hard gales and squally, with hail and snow.

Nov. 13. Lat. 58° 30′ S.; long. 65° 05′ W. Current, E. S. E., 27 miles. Barometer, 28.78; temperature of air, 37°; of water, 38°. Winds: S. W. by W., S. W., W. Commences fresh gales and squally; middle part, baffling airs with snow; latter part, light airs. Ends squally.

Nov. 14. Lat. 57° 55′ S.; long. 65° 44′ W. Current, E., 20 miles. Barometer, 29.03; temperature of air, 37°; of water, 38°. Winds: W., S. W., W. Strong breezes, with snow.

Nov. 15. Lat. 59° 01′ S.; long. 68° 36′ W. Current, E. by S., 20 miles. Barometer, 28.48; temperature of air, 40°; of water, 39°. Winds: W. N. W., N. W. by W., W. by S. Fresh gales, with frequent snow squalls.

Nov. 16. Lat. 58° 08′ S.; long. 69° 31′ W. Current, S. 43° E., 17 miles. Barometer, 29.04; temperature of air, 36°; of water, 40°. Winds: W. S. W., S. S. W., S. S. W. Commences squally; snow and hail; at 8 P. M. hard gales, which lasted all night. Ends moderating.

Nov. 17. Lat. 58° 00′ S.; long. 71° 30′ W. Current, E., 15 miles. Barometer, 28.64; temperature of air, 43°; of water, 40°. Winds: S. W., N. N. W., W. N. W. Commences light breezes; middle and latter parts, cloudy with rain.

Nov. 18. Lat. 57° 33′ S.; long. 71° 44′ W. Current, easterly. Barometer, 28.98; temperature of air, 40°; of water, 40°. Winds: W., W., S. W. At 4 P. M. wore ship to the west. Evening, hard squalls from west; bad sea; wind increased to a hard gale.

Nov. 19. Lat. 56° 48′ S.; long. 73° 00′ W. Barometer, 29.10; temperature of air, 40°; of water, 40°. Winds: S. W., baffling, N. Commences moderating; middle part, light breezes; morning fresh breeze and rainy.

Nov. 20. Lat. 55° 48′ S.; long. 77° 39′ W. Barometer, 29.06; temperature of air, 40°; of water, 40°. Winds: S. E., E., E. by N. Strong breezes and large sea.

Nov. 21. Lat. 54° 05′ S.; long. 81° 12′ W. Barometer, 29.12; temperature of air, 40°; of water, 40°. Winds: E. throughout. Strong breezes and cloudy.

Nov. 22. Lat. 51° 52′ S.; long. 84° 25′ W. Barometer, 29.38; temperature of air, 43°; of water, 41°. Winds: E. N. E., E. S. E., E. S. E. Fine breezes and cloudy.

Nov. 23. Lat. 50° 39′ S.; long. 85° 17′ W. Barometer, 29.78; temperature of air, 44°; of water, 41°. Winds: E. S. E., S. S. E., S. E. Light breezes and cloudy.

Nov. 24. Lat. 49° 41′ S.; long. 86° 05′ W. Barometer, 29.80; temperature of air, 44°; of water, 42°. Winds: W. N. W., E. N. E., E. Light airs and calm; cloudy weather.

John Wade (J. H. Little), 52 days out.

Nov. 4, 1852. Lat. 50° 00′ S.; long. 63° 58′ W. Barometer, 29.40; temperature of air, 45°; of water, 43°. Winds: E., E. by S., E. Strong breezes and squalls, with constant rain.

Nov. 5. Lat. 50° 50′ S.; long. 66° 45′ W. Barometer, 29.30; temperature of air, 44°; of water, 43°. Winds: E. S. E., S., and S. by W. Light breezes and rainy; latter part, clear. A barque in company, sounded in 70 fathoms water.

Nov. 6. Lat. 51° 41′ S.; long. 66° 16′ W. Barometer, 29.50; temperature of air, 50°; of water, 54°. Winds: S. W., calm, and N. Light baffling winds and fine weather.

Nov. 7. Lat. 53° 35′ S.; long. 64° 36′ W. Barometer, 29.30; temperature of air, 52°; of water, 45°. Winds: N. E., N. E., N. N. E. Light breezes and cloudy. Saw many whales.

Nov. 8. Lat. 55° 34′ S.; long. 64° 36′ W. Current, E. N. E., 40 miles. Barometer, 29.10; temperature of air, 45°; of water, 44°. Winds: N., N. W., and W. Light baffling winds and squally, and calm. At 5 P. M. Staten Land bore south, distant 26 miles. At 8 A. M. Cape St. John, S. by E., distant 18 miles. A strong easterly current.

Nov. 9. Lat. 56° 26′ S.; long. 66° 58′ W. Current, E., 20 miles. Barometer, 28.80; temperature of air, 45°; of water, 43°. Winds: N. N. E., N., N. N. W. Light breezes and pleasant. Latter part, moderate breezes and perfectly clear. At 12 M. Cape Horn bore N. by W. ½ W., true, distant 30 miles. Barometer falling steadily.

Nov. 10. Lat. 57° 02′ S.; long. 67° 01′ W. Barometer, 28.60; temperature of air, 40°; of water, 42°. Winds: S. W., S. S. W., N. W. First part, light airs; middle and latter parts, heavy gales, with heavy squalls of wind and rain. At 12 M. close reefed the topsails. At 6 P. M. spoke the ship Golden City, who sailed four days previous. Cape Horn bore N. W., distant 18 miles. Passed another ship standing the same way with ourselves. Barometer falling very fast.

Nov. 11. Lat. 57° 50′ S.; long. 66° 00′ W. Barometer, 28.40; temperature of air, 38°; of water, 39°. Winds: S. S. W., S. W., S. W. Weather the same as yesterday.

Nov. 12. Lat. 58° 13′ S.; long. 65° 27′ W. Current, E. for two days, 60 miles. Barometer, 28.50; temperature of air, 37°; of water, 38°. Winds: S. W., S. W., and S. W. by S. Weather the same, with frequent snow squalls.

Nov. 13. Lat. 57° 39′ S.; long. 66° 27′ W. Current, east, 20 miles. Barometer, 28.60; temperature of air, 35°; of water, 37°. Winds: S. W., S. S. W., and S. W. Heavy gales, and squalls of snow and sleet.

Nov. 14. Lat. 57° 27′ S.; long. 67° 47′ W. Current, E., 14 miles. Barometer, 28.80; temperature

of air, 38°; of water, 37°. Winds: S. S. W., S. W., and W. S. W. First and middle parts, fresh gales, with heavy squalls of wind and snow; a heavy head sea. Two barques in company.

Nov. 15. Lat. 57° 20′ S.; long. 69° 53′ W. Current, E. by N., 20 miles. Barometer, 28.50; temperature of air, 38°; of water, 37°. Winds: W. S. W., W. N. W., and W. Calms, and very heavy squalls of snow; double reefs; exchanged signals with the barque Isabelita Hyne.

Nov. 16. Lat. 57° 18′ S.; long. 71° 39′ W. Current, east, 10 miles. Barometer, 28.90; temperature of air, 39°; of water, 38°. Winds: S. S. W., S. S. W., S. W. First and middle parts, heavy gale; close reef topsails and courses; severe squalls of snow. Latter part, moderate.

Nov. 17. Lat. 57° 51′ S.; long. 73° 55′ W. Current, E. N. E., 20 miles. Barometer, 28.50; temperature of air, 40°; of water, 38°. Winds: N., W. by S., W. Moderate breezes, and showery; at 4 P. M. wore ship.

Nov. 18. Lat. 55° 51′ S.; long. 76° 05′ W. Barometer, 28.90; temperature of air, 40°; of water, 41°. Winds: W. S. W., S. W., W. S. W. Heavy squalls and heavy sea.

Nov. 19. Lat. 55° 02′ S.; long. 78° 12′ W. Current, E. N. E., 20 miles. Barometer, 28.60; temperature of air, 42°; of water, 41°. Winds: W., N. W., and W. Moderate breezes and cloudy.

Nov. 20. Lat. 53° 50′ S.; long. 78° 41′ W. Current, E. N. E., 20 miles. Barometer, 29.00; temperature of air, 44°; of water, 43°. Winds: W. by N., W. by N., and W. S. W. Light baffling squalls and calms.

Nov. 21. Lat. 50° 48′ S.; long. 82° 00′ W. Barometer, 28.70; temperature of air, 45°; of water, 44°. Winds: W. S. W., E. N. E., E. N. E. Moderate; latter part, strong breezes and rain.

Nov. 22. Lat. 49° 24′ S.; long. 84° 01′ W. Current, east, 35 miles in two days. Barometer, 29.10; temperature of air, 46°; of water, 46°. Winds: E. S. E., E. S. E., and S. S. E. Light breezes and rainy; passed two vessels steering north.

Ship White Squall (B. Lockwood), New York to San Francisco, 22 days from Cape St. Roque.

Nov. 8, 1850. Lat. 51° 12′ S.; long. 64° 50′ W. Barometer, 29.70; temperature of air, 64°. Winds: N. W., and S. E. Moderate weather.

Nov. 9. Lat. 53° 32′ S.; long. 65° 15′ W. Barometer, 29.60; temperature of air, 65°. Winds: W. and S. Moderate winds.

Nov. 10. No observation. Barometer, 29.40; temperature of air, 50°. Wind: W. Gale at 12 hours 30 min.; made Cape St. John at 11 A. M.; passed the Straits of Le Maire.

Nov. 11. Lat. 56° 36′ S.; long. no observation. Barometer, 29.40; temperature of air, 35°. Wind: W. Close reefs; rain and hail squalls.

Nov. 12. Lat. 56° 13′ S.; long. 65° 58′ W. Barometer, 29.10; temperature of air, 35°. Wind: W. Snow and hail squalls.

Nov. 13. Lat. 56° 37′ S.; long. 66° 05′ W. Barometer, 29.10 Winds: W., W. by N., and W. by N., strong; snow and hail squalls.

Nov. 14. Lat. 57° 15′ S.; long. 65° 52′ W. Barometer, 28.75; temperature of air, 34°. Wind: W. N. W., strong; snow and hail squalls.

Nov. 15. Lat. 57° 50′ S.; long. 65° 59′ W. Barometer, 28.70; temperature of air, 33°. Wind: W. N. W., strong; snow and hail squalls.

Nov. 16. Lat. 57° 57′ S.; long. 65° 40′ W. Barometer, 29.00; temperature of air, 35°. Wind: W. N. W., strong; snow and hail squalls.

Nov. 17. Lat. 56° 56′ S.; long. 66° 43′ W. Barometer, 29.20; temperature of air, 34°. Wind: W. S. W., strong; hail and snow.

Nov. 18. Lat. 57° 16′ S.; long. 66° 28′ W. Barometer, 29.40; temperature of air, 33°. Wind: W., strong; hail and snow squalls.

Nov. 19. Lat. 57° 37′ S.; long. 66° 38′ W. Barometer, 29.00; temperature of air, 34°. Winds: W., W. N. W., and W. N. W., strong; snow and hail squalls.

Nov. 20. Lat. 65° 52′ S.; long. 57° 28′ W. Barometer, 29.00; temperature of air, 35°. Wind: W., strong; snow and hail squalls.

Nov. 21. Lat. 57° 07′ S.; long. 68° 10′ W. Barometer, 29.20; temperature of air, 32°. Winds: S. W., W. N. W., strong; saw Diego Ramirez.

Nov. 22. No observation. Barometer, 29.00; temperature of air, 35°. Winds: S. W. and W. N. W., strong breeze; snow and hail.

Nov. 23. Lat. 57° 49′ S.; long. 70° 20′ W. Barometer, 29.00; temperature of air, 28°. Wind: W. Close reefs; snow and hail.

Nov. 24. Lat. 59° 23′ S.; long. 74° 10′ W. Barometer, 29.20; temperature of air, 29°. Wind: W. N. W. Close reefs.

Nov. 25. No observation. Barometer, 29.00; temperature of air, 28°. Wind: W. Lying to; snow and hail squalls.

Nov. 26. Lat. 58° 42′ S.; long. 74° 27′ W. Barometer, 28.90; temperature of air, 30°. Wind: W. N. W. Lying to; snow and hail squalls.

Nov. 27. Lat. 57° 47′ S.; long. 74° 10′ W. Barometer, 28.20; temperature of air, 33°. Winds: N. N. W. and W. S. W. Lying to; snow and hail.

Nov. 28. Lat. 55° 19′ S.; long. 73° 28′ W. Barometer, 29.20; temperature of air, 37°. Wind: W. S. W. Close reefs.

Nov. 29. Lat. 54° 51′ S.; long. 74° 25′ W. Barometer, 29.60; temperature of air, 45°. Wind: S. W. First part, close reefs; latter part, light airs and calm.

Nov. 30. Lat. 52° 29′ S.; long. 78° 28′ W. Barometer, 29.80. Wind: S. W. Fine weather; all studding sail.

Dec. 1. Lat. 50° 23′ S.; long. 80° 54′ W. Barometer, 30.25; temperature of air, 60°. Winds: S. W., S. W., and S. E. Fine weather.

Ship Senator (Roland F. Coffin), New York to San Francisco, 60 days out.

Nov. 12, 1853. Lat. 50° 04′ S.; long. 63° 00′ W. Barometer, 29.19; temperature of air, 52°; of water, 46°. Winds: W., calm, W. First part, good winds; at 1 P. M. until 4 A. M., calm; barometer fell to 29.32; went up in an hour to 29.40, as the breeze freshened; after 4 A. M. it again fell; at 8 A. M. barometer, 29.30. I do not see that it is a guide to be depended on certainly; my experience this passage would show its fall to be followed by delightful weather. Ends light breeze from west.

Nov. 13. Lat. 52° 04′ S.; long. 63° 56′ W. Barometer, 29.04; temperature of air, 48°; of water, 46°. Winds: W. by S., W. by S., S. W. by S. Fine weather; barometer still falling; at 10 P. M. 28.97; we shall certainly have *some kind* of weather. Ends with fresh breezes; heavy dew for the last two nights.

Nov. 14. Lat. 52° 27′ S.; long. 65° 34′ W. Barometer, 29.45; temperature of air, 46°; of water, 46°. Winds: S. W. by S., calm, S. W. by S. First part, fresh; middle, calm; saw Aurora Australis; the quadrant from S. E. to S. W., to altitude of 30°; sky cloudless; heavy mass of clouds in S. E.; latter part, moderate breezes.

Nov. 15. No observation. Barometer, 28.80; temperature of air, 38°; of water, 40°. Winds: W., W. N. W., N. W. to S. W. First part, fine weather; middle part, moderate gale. At 4 A. M. made Cape St. Diego, bearing S. per compass, distant 20 miles; intended to pass through the Straits of Le Maire, but wind headed me off. Kept away for Cape St. John; at meridian it bore E. S. E., distant 15 miles.

Nov. 16. Lat. 55° 20′ S.; long. 63° 00′ W. Barometer, 29.0; temperature of air, 40°; of water, 42°. Winds: calm, W., S. S. W. Begins calm; middle, fresh breezes; latter, a gale with snow and hail.

Nov. 17. Lat. 55° 30′ S.; long. 62° 30′ W. Barometer, 29.07; temperature of air, 40°; of water, 40°. Winds: S. W., calm, W. Begins hard gale; found we had been set to the eastward 1½ knots the last 24 hours; middle, calm; latter, light airs. We had a strong set to the N. E. this day.

Nov. 18. Lat. 56° 40′ S.; long. 63° 12′ W. Barometer, 28.88; temperature of air, 42°; of water, 42°. Winds: W., S. W., W. S. W. First and middle part, fine weather; latter, hard gale from W. S. W.

Nov. 19. No observation. Barometer, 29.15; temperature of air, 41°; of water, 42°. Winds: W. S. W., W. S. W., W. N. W. First, hard gale; middle and latter, moderate with snow.

Nov. 20. Lat. 57° 00′ S.; long. 66° 41′ W. Barometer, 29.29; temperature of air, 40°; of water, 44°. Winds: W. N. W., W. S. W., E. First and middle, fresh breezes; latter, moderate.

Nov. 21. Lat. 57° 00′ S.; long. 71° 40′ W. Barometer, 29.29; temperature of air, 38°; of water, 42°. Winds: E. N. E., E. N. E., S. E. First part, thick snow storm; middle, snow storm; latter part, heavy snow. Point Blancard just in sight astern.

Nov. 22. Lat. 56° 25′ S.; long. 74° 22′ W. Barometer, 29.28; temperature of air, 40°; of water, 42°. Winds: S. E., S. E., S. Fine weather and smooth sea.

Nov. 23. Lat. 54° 26′ S.; long. 76° 30′ W. Barometer, 29.70; temperature of air, 42°; of water, 44°. Winds: S. W., S. W., W. S. W. First part moderate, with squalls of snow and hail; middle and latter parts, moderate.

Nov. 24. Lat. 52° 07′ S.; long. 78° 36′ W. Barometer, 29.96; temperature of air, 48°; of water, 48°. Winds: W. S. W., S. W., S. W. Sky overcast; wind increasing; middle and latter parts, moderate.

Nov. 25. Lat. 50° 59′ S.; long. 80° 30′ W. Barometer, 30.07; temperature of air, 52°; of water, 48°. Winds: S. S W., E. S. E., E. S. E. Light winds and pleasant.

Brig Tigris (O. Howe), Salem to San Francisco, from Cape St. Roque, 32 days.

Nov. 14, 1850. Lat. 50° 32′ S.; long. 61° 52′ W. Temperature of air, 57°; of water, 48°. Winds: W. by S., S. W., and W. by S. Strong gales and cloudy.

Nov. 15. Lat. 51° 58′ S.; long. 64° 16′ W. Temperature of air, 51°; water, 48°. Winds: W., N. N. W., and W. N. W. Strong winds and large sea. Current, S. 51° E., 48 miles.

Nov. 16. Lat. 53° 35′ S.; long. 63° 50′ W. Temperature of air, 50°; of water, 48°. Winds: W. N. W., W. by N., W. N. W. First part, strong winds and clear; middle part, heavy gale. Current, E., 24 miles.

Nov. 17. Lat. 55° 12′ S.; long. 63° 41′ W. Temperature of air, 50°; of water, 48°. Winds: W. S. W., W. N. W., and variable. Fresh breezes, and cloudy, squally weather; at 5 A. M. made Staten Land. Current, E., 24 miles.

Nov. 18. Lat. 56° 09′ S.; long. 65° 00′ W. Current, E., 20 miles. Temperature of air, 50°; of water, 47°. Winds: W., N. W., and W. Light breezes and cloudy; latter part, fresh breezes.

Nov. 19. Lat. 56° 41′ S.; long. 65° 57′ W. Temperature of air, 51°; of water, 47°. Winds: W., N. W., and W. N. W. Fresh gales and squally; at 9 A. M. wind hauled to N. W.

Nov. 20. Lat. 57° 00′ S.; long. 65° 48′ W. Temperature of air, 50°; of water, 47°. Winds: W. by S., W. N. W., and N. W. Heavy gales, with lightning.

Nov. 21. Lat. 56° 55′ S.; long. 65° 46′ W. Temperature of air, 48°; of water, 48°. Strong gales and squally, with rain; middle part, more moderate, and calm; latter part, gales and rain.

Nov. 22. Lat. 56° 26′ S.; long. 68° 00′ W. Current, E., 21 miles. Temperature of air, 51°; of water, 47°. Winds: N. W., W., and S. W. Strong gales and heavy sea.

Nov. 23. Lat. 57° 43′ S.; long. 69° 08′ W. Current, E., 24 miles. Winds: N. W., W., and S. W. Temperature of air, 51°; of water, 47°. Hard gales. Cape Horn bearing north, 25 miles. Chronometer is right.

Nov. 24. Lat. 57° 17′ S.; long. 71° 30′ W. Temperature of air, 45°; of water, 44°. Winds: W. by S., N. W., and N. W. Strong gales and cloudy, with rain.

Nov. 25. Lat. 57° 17′ S.; long. 72° 28′ W. Temperature of air, 44°; of water, 42°. Winds: W., W. N. W., and W. N. W. Hard gales and squally, with hail and snow.

Nov. 26. Lat. 59° 31′ S.; long. 74° 57′ W. Temperature of air, 45°; of water, 42°. Winds: W. N. W., N. W., and N. Heavy gales and squally, with hail and snow.

Nov. 27. Lat. 59° 10′ S.; long. 76° 24′ W. Temperature of air, 45°; of water, 43°. Winds: N. N. W., W. S. W., and S. W. Strong gales and squalls, with rain.

Nov. 28. Lat. 57° 50′ S.; long. 76° 30′ W. Current, E., 24 miles. Temperature of air, 45°; of water, 44°. Winds: W., S. W., and W. Strong gales and hard squalls, with snow and sleet.

Nov. 29. Lat. 56° 04′ S.; long. 78° 56′ W. Current, E., 26 miles. Temperature of air, 46°; of water, 44°. Winds: S. W. by S., S. S. W., and S. Fresh breezes, and squalls of snow and hail.

Nov. 30. Lat. 53° 46′ S.; long. 80° 41′ W. Current, E., 24 miles. Temperature of air, 49°; of water, 45°. Winds: S., S. S. W., and S. W. Fresh breezes from the S. W., and snow squalls.

Dec. 1. Lat. 52° 20′ S.; long. 81° 33′ W. Current, E., 24 miles. Temperature of air, 53°; of water, 47°. Winds: S. W., S., and S. by E. Light breezes and cloudy weather.

Dec. 2. Lat. 50° 05′ S.; long. 81° 40′ W. Temperature of air, 52°; of water, 48°. Winds: E. S. E., E., and E. by S. Moderate winds and cloudy weather.

Ship Revere (Charles W. Hamilton), Boston to California, 62 days out.

Nov. 16, 1852. Lat. 49° 24′ S.; long. 52° 41′ W. Barometer, 29.31; temperature of air, 40°. Winds: N. N. W., W. N. W., W. First part, moderate; middle and latter, squally, with gales of snow and hail.

Nov. 17. Lat. 50° 48′ S.; long. 52° 51′ W. Barometer, 29.36; temperature of air, 40°. Winds: W., W. S. W., W. by N.; squally, with gales of snow and hail.

Nov. 18. Lat. 51° 49′ S.; long. 55° 19′ W. Barometer, 29.26; temperature of air, 40°. Winds: W. by N., W. N. W., N. W.; baffling and squally weather.

Nov. 19. Lat. 53° 49′ S.; long. 56° 04′ W. Barometer, 30.1; temperature of air, 40°. Winds: N. W. by W., W., W.; changeable and squally, with heavy sea from S. S. W.

Nov. 20. Lat. 58° 40′ S.; long. 86° 13′ W. Barometer, 29.23; temperature of air, 48°. Winds: W , N. N. W., S. W. by S.; weather changeable; ends, light airs and rain.

Nov. 21. Lat. 55° 04′ S.; long. 60° 47′ W. Barometer, 29.28; temperature of air, 40°. Winds: S. W. by S., N. to N. W., N. W.; light breezes and light rain; middle, calm; latter, airs.

Nov. 22. Lat. 55° 46′ S.; long. 64° 32′ W. Barometer, 29.26; temperature of air, 40°. Winds: N. W., S. to S. S. E., S. S. E.; changeable and cloudy, with snow squalls, calms, and baffling airs.

Nov. 23. Lat. 56° 43′ S.; long. 66° 19′ W. Barometer, 29.28; temperature of air, 40°. Winds: S. S. E. to S. W., W., W. S. W; changeable and baffling; made Staten Land, distant about 50 or 60 miles; had a current in our favor for last 48 hours.

Nov. 24. Lat. 57° 58′ S.; long. 66° 09′ W. Barometer, 29.30 Winds: W. S. W., S. W., S. S. W.; strong breezes and squally, rain, hail, and snow.

Nov. 25. No observation. Barometer, 30.12. Winds: S. S. W., S. S. W., S. W.; changeable weather; made the land off Cape Horn, bearing north.

Nov. 26. Lat. 56° 48′ S.; long. 67° 54′ W. Barometer, 30.12. Winds: W. S. W., S. W.; calm and baffling airs, light breezes and fine weather.

Nov. 27. Lat. 57° 42′ S.; long. 70° 24′ W. Barometer, 29.34. Winds: E., W. N. W., N. N. W. First part, light breezes and pleasant; middle, fresh; latter, moderate; cloudy and foggy weather.

Nov. 28. Lat. 28° 45′ S.; long. 73° 23′ W. Barometer, 29.21. Winds: W. N. W. throughout; fine breezes and squally.

Nov. 29. Lat. 59° 08′ S.; long. 74° 33′ W. Barometer, 29.19. Winds: W. N. W., W., W. S. W. to N. W.; baffling airs and squally, with snow, hail, and rain.

Nov. 30. Lat. 58° 56′ S.; long. 74° 37′ W. Barometer, 29.23. Winds: N W. and calm, calm and S. S. W.; changeable airs and calms, and squally appearances.

Dec. 1. Lat. 56° 23′ S.; long. 76° 45′ W. Current, E. by N., 24 miles. Barometer, 29.35. Winds: baffling, S. S. W., S. W. by W., W. S. W.; variable airs; squalls of snow, hail, and rain.

Dec. 2. Lat. 55° 11′ S.; long. 77° 48′ W. Current, S. by E. 16 miles. Barometer, 29.36. Winds: baffling, W. S. W., S. S. W., S.; variable breezes and calm; latter, good breezes.

Dec. 3. Lat. 53° 04′ S.; long. 80° 06′ W. Barometer, 30. Winds: S. by W. to S. W., S. E., E. to N. E.; variable airs and cloudy.

Dec. 4. Lat. 50° 54′ S.; long. 83° 29′ W. Current, S. W. by S., 37 miles. Winds: N. E., S. E., S. W.; variable breezes, and cloudy, rainy weather.

Adelaide Metcalfe (George Scott).

Dec. 4, 1853. Lat. 45° 09′ S.; long. 53° 42′ W. Barometer, 29.55; temperature of air, 52°; of water, 49½°; water, at 10 feet 6 inches depth, 49½°. Winds: W. S. W., W. S. W., N. W. First and middle, moderate and clear; latter, light airs, calm and rainy. At 8 P. M. water 64°, and at 9 A. M. as per log. I think it very singular, so great a change from cold to warm, and the reverse, when we have made so little distance. Saw one patch of kelp. The water has the appearance of being shoal, and has most of the time for several days. At 12 M. the barometer down to 29.44, and falling slowly; think it indicates northerly winds; no observations.

Dec. 5. Lat. 46° 01′ S.; long. 54° 02′ W. Current, E. N. E., ¾ knot per hour. Barometer, 29.49; temperature of air, 52°; of water, 51½°; water, at 10 feet 6 inches depth, 51½°. Winds: N. N. W., S. E., N. E. First and last parts, cloudy at times, some rain; wind baffling, but averaging as per log: middle part, clear; barometer has varied several times, and the water from 2° to 3°; twice saw several patches of kelp; most of the time a bad sea from southward: ends clear, and very light airs from N. N. W. Think my D. R. was wrong yesterday.

Dec. 6. Lat. 47° 07′ S.; long. 55° 04° W. Barometer, 29.66; temperature of air, 47°; of water, 47½°; water, at 10 feet 6 inches depth, 47½°. Winds: W., W. S. W., N. N. W. All this day moderate and cloudy, with smooth sea; no observation; saw some sea-weed and kelp. First part, barometer stationary at 29.46; middle, rose as per log, and so remained until 11 A. M., then fell.

Dec. 7. Lat. 48° 32′ S.; long. 57° 44′ W. Barometer, 29.57; temperature of air, 45°; of water, 44°; water, at 10 feet 6 inches depth, 44°. Winds: N. N. W., W. N. W., S. Commences moderate; barometer

falling; at 4 P. M. strong breeze, barometer 29.45, and stationary; middle part, moderate, barometer stationary; at 4 A. M. tacked to the westward; latter part, moderate, barometer rising fast, at noon stood at 29.77; ends, fine clear weather, and bad sea from S. W.; saw much kelp and sea-weed at 6 P. M., and until 8 P. M. the water had the peculiar green appearance it usually has on soundings, so much so that it was noticed by every person on board.

Dec. 8. Lat. 49° 06′ S.; long. 59° 03′ W. Current, W. N. W., ½ knot per hour. Barometer, 29.87; temperature of air, 48°; of water, 46°; water, at 10 feet 6 inches depth, 46°. Winds: calm, W. N. W., W. All this day fine clear weather; middle part, barometer rising; at 4 A. M. stood at 29.92; at noon, 29.81, and falling slowly; saw kelp and sea-weed; latter part, water has the appearance of being very shoal.

Dec. 9. Lat. 50° 35′ S.; long. 61° 20′ W. Current, W. S. W., ¾ knot per hour. Barometer, 29.43; temperature of air, 48°; of water, 46½°; water, at 10 feet 6 inches in depth, 46½°. Winds: N. W., N. W., W. S. W. First part, moderate; middle, strong breeze; latter part, light airs. First part, barometer falling, and so continues to do until midnight, when it stood at 29.43, and has so remained since; at 4 P. M. (the water still having the appearance of being very shoal) hove to, to get a cast of the lead, but did not get bottom with 60 fathoms; at 10 A. M. made the Jason Islands, bearing S. by E. by compass, distant 25 or 30 miles; saw much kelp and sea-weed and one right whale.

Dec. 10. Lat. 52° S.; long. 61° 55′ W. Barometer, 29.20; temperature of air, 47°; of water, 46°; water, at 10 feet 6 inches depth, 46°. Winds: W., N. W., W. S. W. First part, fine weather and moderate, barometer falling; middle, strong breeze, barometer at midnight, 29.20, and stationary; latter part, fresh gales; saw a great number of whales, and much kelp and sea-weed.

Dec. 11. Lat. 52° 12′ S.; long. 62° W. Current, N. N. E., ¾ knot per hour. Barometer, 29.38; temperature of air, 42°; of water, 46½°; water, at 10 feet 6 inches depth, 46°. Winds: W. S. W., calm, calm. First four hours, strong gales and very heavy sea. From 4 P. M. until 8 P. M. little more moderate; middle and latter parts, calm, and light baffling airs all round the compass. First part, barometer rose .18, and has remained stationary since; saw several whales, and much kelp and weed.

Dec. 12. Lat. 53° 40′ S.; long. 65° 17′ W. Barometer, 29.1; temperature of air, 44°; of water, 43½°; water, at 10 feet 6 inches depth, 43½°. Winds: calm, N. W., W. All this day clear weather; middle and latter part, light winds; saw much weed and several whales; latter part, barometer falling.

Dec. 13. In Straits of Le Maire. Barometer, 28.85; temperature of air, 44°; of water, 44°; water, at 10 feet 6 inches depth, 44°. Winds: W., ——., N. W. First and last part, moderate breeze, clear and rainy alternately; middle part, calms, heavy squalls of two or three minutes' duration, and the wind all round the compass. At 8 P. M. made Staten Land to the S. S. W.; at noon, Cape Good Success bore W. by S., distant 6 miles. Barometer falling steadily; saw several whales.

Dec. 14. No observation. Barometer, 28.73; temperature of air, 36½°; of water, 41°; water, at 10 feet 6 inches depth, 41°. Winds: N. W., W., S. W. First six hours, good breeze from N. W.; next ten

hours, fresh gales, as per log, with occasional short spells of calms; at 4 A. M. commenced a heavy gale from S. W., attended with snow, rain, and hail, and bad sea; wore ship to the W. N. W.; barometer stationary, as per log.

Dec. 15. No observation. Barometer, 29.10; temperature of air, 37°; of water, 42°; water, at 10 feet 6 inches depth, 42°. Winds: S. W., S. S. W., south. First part, very heavy gales, barometer rising; middle part, tremendous gale; latter part, moderate; made sail and wore to the W. S. W.; at 10 A. M. made Staten Land to the N. N. W., distant 18 miles, barometer rising. All through the day thick weather, snow, rain, and hail.

Dec. 16. No observation. Barometer, 29.25; temperature of air, 42°; of water, 44°; water, at 10 feet 6 inches depth, 44°. Winds: S., calm, N. N. E. First part, light winds and clear weather; middle, calm; latter, moderate breeze and thick rainy weather, with very heavy swell from the eastward. First part, barometer rising, and middle part up to 29.39; at 2 A. M. started down; at 9 A. M., as per log, and at noon 29.14, and still falling.

Dec. 17. No observation. Barometer, 29.03; temperature of air, 39½°; of water, 40½°; water, at 10 feet 6 inches depth, 40°. Winds: N. N. W., W., S. W.; first three hours rainy, and wind from N. N. E.; barometer falling from that time until 10 A. M.; wind veering nearly every hour from W. to S. by W., with strong breeze, light airs, and calms, and the weather looking most of the time very dirty, attended with drizzling rain, sleet, snow, and hail. At 10 A. M. wind jumped suddenly to S. S. E.: at midnight, barometer 29.91, and stationary at 9 A. M., as per log; and at noon 29.15, and rising fast.

Dec. 18. Lat. 56° 43′ S.; long. 66° 02′ W. Current, N. E., 62 miles in two days. Barometer, 29.5; temperature of air, 42°; of water, 42°; water, at 10 feet 6 inches depth, 41°. Winds: S. S. W., W. S. W., N. N. W.; first four hours strong squalls, with snow and rain; middle part, light and baffling, with very fine weather; latter part, strong breeze and cloudy. First part, barometer rising fast; at 10 A. M. near 29.67; latter part, falling.

Dec. 19. Lat. 57° 51′ S.; long. 67° 18′ W. Current, N. E. by E., 1 knot per hour. Barometer, 29.14; temperature of air, 42°; of water, 41°; water, at 10 feet 6 inches depth, 41°. Winds: N. W. by W., W., W. First and middle parts, strong gales, most of the time rain, hail, and snow; mercury fluctuating several times, but rising.

Dec. 20. Lat. 58° 01′ S.; long. 67° 10′ W. Current, N. E., ½ knot per hour. Barometer, 29.54; temperature of air, 39°; of water, 40½°; water, at 10 feet 6 inches depth, 40°. Winds: S. W. by W., S. S. W., S. W. First part, fresh gales and heavy squalls, with snow, rain, and hail; middle, heavy gales at 8 A. M.; latter part, very light; all this day mercury rising steadily.

Dec. 21. Lat. 58° 01′ S.; long. 66° 42′ W. Current, E. N. E., 1¼ knot per hour. Barometer, 29.5; temperature of air, 41°; of water, 40½°; water, at 10 feet 6 inches depth, 40½°. Winds: W. by S., W. S. W., W.; all this day light airs and baffling, and fine weather, with heavy swell from westward; mercury very steady; at 10 A. M. light breeze from the eastward.

Dec. 22. No observation. Barometer, 29.41; temperature of air, 41°; of water, 42°; water, at 10

feet 6 inches depth, 42°. Winds: E. by N., E. by N., E by S.; all this day moderate breezes and cloudy weather; mercury fell a little the first part.

Dec. 23. Lat. 56° 24′ S.; long. 75° 19′ W. Current, E. by S., ½ knot per hour. Barometer, 29.53; temperature of air, 40°; of water, 42½°; water, at 10 feet 6 inches depth, 42°. Winds: E. by S., E. by S., E. S. E.; all this day, moderate; last two hours clear, and mercury rising slowly. Thus far, I think the barometer has been an infallible guide as to the weather.

Dec. 24. Lat. 54° 50′ S.; long. 78° 06′ W. Barometer, 29.65; temperature of air, 40°; of water, 44°; water, at 10 feet 6 inches depth, 44°. Winds: E., E. N. E., N. E.; all this day light breezes and cloudy. First part, mercury rising; middle part, 29.74; latter part, falling slowly, and wind hauling to the north.

Dec. 25. Lat. 53° 09′ S.; long. 79° 08′ W. Barometer, 29.47; temperature of air, 45°; of water, 45°; water, at 10 feet 6 inches depth, 45½°. Winds: N. N. E., N. N. E., calm, W. First twelve hours good breeze and rainy weather; next four hours calm; latter part, light breeze and cloudy.

Dec. 26. Lat. 52° 19′ S.; long. 79° 04′ W. Barometer, 29.44; temperature of air, 46°; of water, 47½°; water, at 10 feet 6 inches depth, 47½°. Winds: N. W., W., W. First part, fresh gales; middle and latter parts, more moderate, but squally.

Dec. 27°. No observation. Barometer, 29.7; temperature of air, 49°; of water, 48½°; water, at 10 feet 6 inches in depth, 48°. Winds: W., W. by S., W. N. W.; all this day strong breezes; middle and latter parts, rainy; mercury rising steadily. I intend to touch at Juan Fernandez.

Ship Flying Fish (Edward C. Nickels), New York to San Francisco, 48 days out.

Dec. 18, 1852. Lat. 48° 15′ S.; long. 63° 39′ W. Barometer, 29.78; temperature of air, 51°; of water, 50°. Winds: S. W., S. W., N. N. E. Wind, fresh; middle and latter, light.

Dec. 19. Lat. 51° 11′ S.; long. 64° 54′ W. Barometer, 29.90; temperature of air, 48°; of water, 46°. Winds: N. N. E. to N. N. W., N. to N. W., S. W. Moderate and cloudy; latter, clear.

Dec. 20. Lat. 54° 56′ S.; long. 65° 07′ W. Barometer, 29.50; temperature of air, 47°; of water, 46°. Winds: S. W., S. S. W. to W., westerly. First part, clear and pleasant; latter, cloudy.

Dec. 21. Lat. 55° 16′ S.; long. ——. Temperature of air, 52°; of water, 45°. Winds: S., E., N. First part, light airs, passed through Straits of Le Maire; middle, nearly calm; latter part, fresh N. E. breezes with fog, Staten Land bearing N. by W., true distance 28 miles.

Dec. 22. Lat. 56° 06′ S.; long. ——. Winds: N. W. to N. E., N. E., N. E. First part, light airs; middle and latter parts, passed Cape Horn bearing N. ½ E., distant 7 miles; foggy.

Dec. 23. Lat. 55° 08′ S.; long. 74° 29′ W. Barometer, 29.30; temperature of air, 45°; of water, 43°. Wind: N. E. throughout. Fresh breezes, and foggy; St. Ildefonso Island bearing N. E. by N., 18 miles.

Dec. 24. Lat. 51° 55′ S.; long. 79° 35′ W. Temperature of air, 45°; of water, 45.° Winds: E.,

baffling, N. E. First part, fresh winds and thick weather; middle, light baffling breezes and showers; latter part, N. E. wind.

Dec. 25. Lat. 49° 15′ S.; long. 80° 08′ W. Barometer, 29.50; temperature of air, 48°; of water, 47°. Winds: N., W., W. Strong northwardly winds and rain; wind suddenly hauled to westward, with light rain.

Ship John Gilpin (Justus Doane), New York to San Francisco, 46 days out.

Dec. 13. Lat. 48° 40′ S.; long. 60° 36′ W. Barometer, 29.32; Winds: W., W. by S., W. by S. Strong breezes, and squally.

Dec. 14. Lat. 51° 05′ S.; long. 63° 58′ W. Barometer, 29.10. Winds: W. by N., S. S. W., S. S. W. First and middle, moderate; latter, squalls and gales.

Dec. 15. Lat. 49° 50′ S.; long. 63° 02′ W. Barometer, 29.65. Winds: S. W., S. W., S. W. by S. Hard squalls and gales.

Dec. 16. Lat. 51° 07′ S.; long. 65° 12′ W. Barometer, 29.55. Winds: S. S. W., S. W., W. by S. Light baffling airs, and calm.

Dec. 17. Lat. 53° 56′ S.; long. 65° 10′ W. Barometer, 29.55. Winds: W. N. W., W. by N., S. S. W. First part, light breezes; middle and latter, gales.

Dec. 18. Lat. 55° 06′ S.; long. 64° 40′ W. Barometer, 29.80. Winds: S. W. by S., W. S. W., N. W. by W. First part, moderate; middle, light; latter, squalls, with rain.

Dec. 19. Lat. 56° 42′ S.; long. 66° 07′ W. Barometer, 29.45; temperature of air, 46°. Winds: N. W. by W., S. W. by W., N. W. by W. Moderate gales and puffy.

Dec. 20. Lat. 56° 20′ S.; long. 66° 32′ W. Barometer, 29.95; temperature of air, 42°. Winds: W. by N., W. by S., S. W. First and middle, gales, with hail, rain, and snow; latter, light.

Dec. 21. Lat. 56° 45′ S.; long. 67° 20′ W. Barometer, 29.62; temperature of air, 43°. Winds: S. W., W. N. W., calm. First part, light; middle, light airs and calms; latter, calms and fog.

Dec. 22. Lat. 56° 20′ S.; long. 72° 10′ W. Barometer, 29.45; temperature of air, 46°. Winds: E. S. E., E. by N., E. by N. Light breezes and hazy.

Dec. 23. Lat. 55° 48′ S.; long. 79° 08′ W. Barometer, 29.70; temperature of air, 42°. Winds: E. by N., E. by N., E. Moderate breezes and hazy.

Dec. 24. Lat. 53° 48′ S.; long. 83° 24′ W. Barometer, 29.55; temperature of air, 46°. Winds: E., E. N. E., N. N. E. First, light breezes; latter, fresh breezes and rainy.

Dec. 25. Lat. 51° 41′ S.; long. 84° 07′ W. Barometer, 29.45; temperature of air, 48°. Winds: W. N. W., N., N. W. First part, light; middle part, moderate; latter part, strong breezes and rainy throughout.

Dec. 26. Lat. 48° 32′ S.; long. 83° 40′ W. Barometer 29.92; temperature of air, 49°. Winds: W. N. W., W., W. Strong breezes, rainy and hazy throughout.

Ship Wild Pigeon (W. Putnam), New York to San Francisco, 42 days out.

Dec. 9. Lat. 49° 32′ S.; long. 65° 13′ W. Barometer, 29.40; temperature of air, 48°; of water, 48°. Winds: W. N. W., W. N. W., W. S. W. Moderate and fair. At midnight a blow.

Dec. 10. Lat. 52° 09′ S.; long. 65° 31′ W. Barometer, 29.35; temperature of air, 44°; of water, 46°. Winds: W. S. W., S. W., S. W. First, moderate; second, strong and squally; third, a gale from southwest.

Dec. 11. Lat. 58° 08′ S.; long. 65° 08′ W. Barometer, 29.45; temperature of air, 40°; of water, 45°. Winds: S. W. hauling to W., calm, calm. First part, blowing hard; second and third parts, calm.

Dec. 12. Straits of Le Maire. Barometer, 28.90; temperature of air, 45°; of water, 42°. Winds: W. S. W., N. W., calm. First, moderate and cloudy; second, same; latter, calm and cloudy.

Dec. 13. Lat. 56° 27′ S.; long. 65° 45′ W. Barometer, 28.60. Current, easterly, 24 miles. Temperature of air, 42°; of water, 41°. Winds: N., N. W., N. W. First, light winds. At 10 P. M. a white squall. Second and third parts, moderate.

Dec. 14. Lat. 56° 28′ S.; long. 66° 44′ W. Barometer, 28.40. Current, easterly, 1¼ mile. Temperature of air, 39°; of water, 41°. Winds: N. W. and variable, S. S. E., S. W. First, moderate; middle and latter, squalls. Gales, hail, rain, and snow.

Dec. 15. Lat. 56° 52′ S.; long. 66° 52′ W. Barometer, 28.80; current easterly, 1 mile per hour; temperature of air, 38°; of water 40°. Winds: S. W., S. S. W., S. E. First part, hard gale; second part, blowing in hard squalls; third part, moderate.

Dec. 16. Lat. 56° 59′ S.; long. 68° 13′ W. Barometer, 29.00; current, easterly, ¾ mile per hour; temperature of air, 42°; of water, 42°. Winds: calm, calm, N. W. First and second parts, calm; latter, moderate.

Dec. 17. Lat. 56° 52′ S.; long. 70° 24′ W. Barometer, 28.75; current, easterly, 1 mile per hour. Winds: N. W. by W., S. W., S. S. W. First part, fresh breezes and rainy; second part, hard gale; third part, moderate.

Dec. 18. Lat. 56° 21′ S.; long. 72° 59′ W. Barometer, 29.15; current, easterly, 1 mile per hour. Winds: S. W., W., W. N. W. First part, light; second part, moderate; third part, gale.

Dec. 19. Lat. 59° 20′ S.; long. 73° 29′ W. Barometer, 29.10; current, easterly, 30 miles; temperature of air, 40°; of water, 42°. Winds: W. by S., W. S. W., W. N. W. First part, gale; second part, gale; third part, gale; rainy throughout.

Dec. 20. Lat. 56° 24′ S.; long. 73° 42′ W. Barometer, 29.15; temperature of air, 43°; of water, 42°. Winds: S. W., W. S. W., W. First part, gale and rainy; second part, moderate and rain; third part, moderate and fair.

Dec. 21. Lat. 56° 14′ S.; long. 75° 58′ W. Barometer, 29.40; temperature of air, 45°; of water, 44°. Winds: W. N. W., calm, N. E. First part, light breezes; second part, calm and rainy; third part, moderate and fair.

Dec. 22. Lat. 55° 14′ S.; long. 78° 43′ W. Barometer, 29.25; temperature of air, 47°; of water,

43°. Winds: N. by E., W. N. W., N. E. First and second parts, light breezes and rainy; third parts, moderate.

Dec. 23. Lat. 53° 07′ S.; long. 81° 35′ W. Strong easterly current. Barometer, 29.70; temperature of air, 46°; of water, 44°. Winds: E., S. E. by E., E. S. E.; moderate and rainy.

Dec. 24. Lat. 51° 35′ S.; long. 84° 50′ W. Current, easterly, 45 miles. Barometer, 29.40; temperature of air, 45°; of water, 44°. Winds: E. by S., N. E., N. W. First part, moderate; second part, baffling winds and rainy; third part, strong breezes.

Dec. 25. Lat. 49° 05′ S.; long. 84° 41′ W. Barometer, 29.40; temperature of air, 48°; of water, 46°. Winds: W., W. N. W., N. W.; moderate and rainy.

Ship John Jay (J. B. B. Engleman), New Bedford to San Francisco, 76 days out.

Dec. 12. Lat. 48° 56′ S.; long. 62° 53′ W. Barometer, 29.40; temperature of air, 48°; of water, 48°. Winds: W. by N., N. to N. E., W. N. W.; light and baffling.

Dec. 13. Lat. 51° 01′ S.; long. 65° 00′ W. Barometer, 29.10; temperature of air, 49°; of water, 46°. Winds: N. N. E., N., N.; moderate and pleasant.

Dec. 14. Lat. 52° 54′ S.; long. 64° 05′ W. Barometer, 29.24; temperature of air, 44°; of water, 44°. Winds: S. S. W., S. W., S. W. to W. N. W.; moderate and pleasant.

Dec. 15. Lat. 54° 07′ S.; long. 64° 24′ W. Barometer, 29.40; temperature of air, 50°; of water, 45°. Winds: W. S. W., calm, N. N. E.; light airs and middle calm.

Dec. 16. Lat. 55° 24′ S.; long. 64° 20′ W. Barometer, 29.20; temperature of air, 48°; of water, 44°. Winds: N. N. W., N. N. W., N. W.; light breezes and pleasant.

Dec. 17. Lat. 55° 41′ S.; long. 63° 30′ W. Barometer, 29.28; temperature of air, 47°; of water, 42°. Winds: S., calm, N. W. by W. to W. First and third parts, light; middle, calm.

Dec. 18. Lat. 56° 39′ S.; long. 65° 40′ W. Barometer, 28.65; temperature of air, 40°; of water, 39°. Winds: N. N. W., N. by W., N. W. by W. Strong breezes and rainy.

Dec. 19. Lat. 56° 37′ S.; long. 66° 00′ W. Barometer, 28.77; temperature of air, 41°; of water, 40°. Winds: N. N. W., W., W. Light breezes and rainy.

Dec. 20. Lat. 56° 23′ S.; long. 67° 29′ W. Barometer, 29.30; temperature of air, 41°; of water, 41°. Winds: W., N. E. to E. N. E., E. N. E. First part, light; second and third parts, brisk breezes.

Dec. 21. Lat. 57° 04′ S.; long. 72° 29′ W. Barometer, 29.23; temperature of air, 38°; of water, 41°. Winds: E. N. E., E. N. E., E. S. E. Fresh breezes and cloudy.

Dec. 22. Lat. 56° 03′ S.; long. 75° 40′ W. Barometer, 29.30; temperature of air, 40°; of water, 41°. Winds: S. S. E. to S. by W., S. to S. W., S. S. W. First and third parts, light; second, moderate.

Dec. 23. Lat. 55° 16′ S.; long. 76° 30′ W. Barometer, 29.30; temperature of air, 42°; of water, 42°. Winds: S. W. to S. S. W., S. W., calm. Light breezes; latter, calm.

Dec. 24. Lat. 54° 52′ S.; long. 77° 40′ W. Barometer, 29.40; temperature of air, 42°; of water, 44°. Winds: S., calm, calm. First part, light airs; second and third parts, calm.

Dec. 25. Lat. 54° 25′ S.; long. 79° 30′ W. Barometer, 29.00; temperature of air, 44°; of water, 44°. Winds: N. N. W., N. N. W., S. W. by W. Strong winds and squally.

Dec. 26. Lat. 52° 45′ S.; long. 79° 07′ W. Barometer, 29.00; temperature of air, 44°; of water, 44°. Winds: W. S. W., W. by S., W. by S. Strong breezes and rainy.

Dec. 27. Lat. 51° 10′ S.; long. 79° 15′ W. Barometer, 28.90; temperature of air, 46°; of water, 46°. Winds: S. S. W., S. W., N. N. W. Fresh gales and rainy.

Dec. 28. Lat. 49° 50′ S.; long. 78° 50′ W. Barometer, 29.20; temperature of air, 46°; of water, 46°. Winds: S. S. W., S. W., N. W. Fresh gales and rainy.

Dec. 29. Lat. 50° 56′ S.; long. 79° 31′ W. Barometer, 29.08; temperature of air, 46°; of water, 44°. Winds: N. W., N. W. by W., W. S. W. Strong gales and cloudy.

Dec. 30. Lat. 50° 35′ S.; long. 79° 26′ W. Barometer, 29.20; temperature of air, 42°; of water, 44°. Winds: W. S. W., S. W., S. S. W. Hard gales and cloudy weather.

Dec. 31. Lat. 48° 04′ S.; long. 80° 07′ W. Barometer, 29.40; temperature of air, 44°; of water, 46°. Winds: W. S. W., W. by S., W. First and second parts, strong gales; latter, moderate.

Ship Anstiss (Milton P. Hedge), Richmond to San Francisco, 25 days from Cape St. Roque.

Dec. 10, 1852. Lat. 50° 16′ S.; long. 62° 14′ W. Winds: W. S. W., W., and W. S. W. Heavy gales.

Dec. 11. Lat. 50° 44′ S.; long. 62° 22′ W. Winds: W. S. W., S. S. W., and S. W. Moderate gales.

Dec. 12. Lat. 51° 37′ S.; long. 63° 56′ W. Winds: W., N. W., and W. S. W. Fresh and squally.

Dec. 13. Lat. 53° 48′ S.; long. 64° 30′ W. Winds: W. S. W., and W. N. W. Fresh and squally.

Dec. 14. Lat. 54° 30′ S.; long. 63° 00′ W. Winds: baffling. Strong breezes and heavy gales.

Dec. 15. Lat. 54° 43′ S.; long. 62° 38′ W. Winds: S. E., S., and N. Light breezes and rain.

Dec. 16. Lat. 54° 58′ S.; long. 63° 08′ W. Baffling winds.

Dec. 17. Lat. 55° 57′ S.; long. 63° 19′ W. Winds: N., S. W., and W. S. W. Light winds and rain.

Dec. 18. Lat. 56° 42′ S.; long. 65° 18′ W. Winds: S. W. and N. W. Light winds and rain.

Dec. 19. Lat. 57° 44′ S.; long. 66° 28′ W. Winds: N. W., W., and W. Heavy gales.

Dec. 20. Lat. 57° 57′ S.; long. 66° 53′ W. Wind: W. Light breeze.

Dec. 21. Lat. 57° 57′ S.; long. 67° 06′ W. Winds: W., S. W., E. N. E. Light breezes.

Dec. 22. Lat. 57° 10′ S.; long. 71° 58′ W. Wind: E. by N. Strong breezes.

Dec. 23. Lat. 56° 09′ S.; long. 77° 20′ W. Winds: E. by N., E. S. E., E. S. E. Strong breeze.

Dec. 24. Lat. 55° 02′ S.; long. 80° 30′ W. Winds: E. S. E., E., N. N. E. Strong breeze.

Dec. 25. Lat. 54° 24′ S.; long. 82° 30′ W. Winds: N. N. E., W., and W. N. W. Heavy gales.

Dec. 26. Lat. 53° 00′ S.; long. 81° 00′ W. Winds: N. W., N. W., and W. Strong gales.

Dec. 27. Lat. 51° 05′ S.; long. 79° 38′ W. Winds: baffling. Strong winds and squally, with rain.

Dec. 28. Lat. 49° 24′ S.; long. 78° 34′ W. Wind: W. N. W. Strong breezes and squally, with rain.

I have given such copious extracts, with regard to the Cape Horn passage, because I wanted, by practical illustrations and example, to impress navigators with a correct estimate as to its difficulties.

And, still further to illustrate this route, the following table of Cape Horn crossings has been prepared. It shows the crossings according to the month; it shows the time from the parallel of St. Roque to the parallel of 50° S. in the Atlantic; the longitude in which each vessel crossed the parallel of 50°, 53°, and 56° S., east of the Horn; then, as the course is west, it shows the parallels upon which the meridians of 67°, 71°, and 73° W. are crossed. Thence the course is to the northward again, and the table shows the meridians upon which the parallels of 55°, 53°, and 50° S., in the Pacific, are crossed.

The last column shows the time from lat. 50° in the Atlantic to the same parallel in the Pacific, which is generally the difficult part, and always the turning point of the passage.

Cape Horn Crossings.

NAME OF VESSEL.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN. 50° S.	53° S.	56° S.	LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN. 67° W.	71° W.	75° W.	LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN. 55° S.	53° S.	50° S.	FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
JANUARY.											
Danube	33	63°	64°	69°	56°	56°	57°	77°	80°	80°	23
Contest	23	61	64	67	56	59	57	78	80	81	12
Tingqua	26	64	66	64	57	57	56	80	80	80	14
Alboni	26	64	64	64	57	57	56	76	79	85	16
F. W. Brune . . .	33	64	64	63	60	59	59	84	87	89	21
Cygnet	33	64	65	67	56	57	56	77	80	85	21
Gray Feather . . .	25	61	64	63	57	57	56	76	77	79	19
Golden Gate . . .	20	65	64	67	56	56	55	75	77	79	11
Telegraph	24	60	65	65	57	58	56	76	78	81	15
Trade Wind . . .	22	65	65	67	57	58	59	75	82	81	12
Eagle	21	62	65	66	57	57	57	79	81	82	10
Edwin	29	66	65	66	57	58	58	80	81	80	25
Telegraph	24	65	65	65	57	57	56	76	78	78	20
Means	24.6	63.4	64.6	65.6	56.9	57.4	56.7	79.6	80.1	80.0	16
FEBRUARY.											
John Holland . .	31	65	66	63	58	59	57	76	80	79	26
Kentucky	33	61	65	71	56	56	56	77	78	82	25
Storm	23	57	61	67	57	58	58	77	78	79	12
A. F. Jenness* . .	44	66	66	66	57	58	57	76	78	80	20
John Bertram . .	25	65	65	63	56	56	57	81	81	84	12
Flying Childers . .	26	65	65	65	58	58	58	79	80	81	12
Golden West . . .	30	65	66	66	57	57	57	77	78	81	14
Bald Eagle . . .	19	64	65	69	56	57	57	77	79	84	10
Phantom	23	65	66	64	57	58	59	80	79	84	15
Winged Racer . .	26	66	65	69	57	57	56	81	83	82	14
Anna Kimball . .	30	66	66	66	57	57	58	78	79	79	17
Roman	28	65	65	66	57	58	57	80	83	85	14
Eagle Wing . . .	24	65	65	66	56	57	56	76	76	78	10
Flying Cloud . . .	21	66	66	67	56	56	56	78	79	80	12
Game Cock . . .	23	63	64	64	57	58	57	79	78	79	19
Archer	28	65	65	64	56	56	56	79	79	79	14
North Carolina . .	30	54	56	61	57	59	56	75	77	79	29
Means	27.3	63.7	64.5	65.7	56.8	57.3	56.9	78.0	79.1	80.8	16.1

* She is famous for long passages. See p. 464.

Cape Horn Crossings—Continued.

NAME OF VESSEL.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN.			LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN.			LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN.			FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
		50° S.	53° S.	56° S.	67° W.	71° W.	75° W.	55° S.	53° S.	50° S.	
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
MARCH.											
Aldebaran	28	66°	65°	66°	56°	59°	57°	77°	80°	84°	28
Esther May . . .	29	64	62	65	58	60	56	77	80	81	23
Lucknow	26	65	66	63	60	58	56	78	81	86	25
Masconoma . . .	32	65	65	66	57	56	56	78			
Tornado	25	65	65	65	56	58	57	77	80	84	13
Eagle	24	64	65	66	57	58	58	78	83	86	13
Celestial	24	63	64	66	56	57	56	77	79	81	18
Amelia	26	63	64	63	59	57	55	78	79	80	26
Phantom	23	65	66	63	57	59	59	80	79	81	14
Stag Hound . . .	22	65	64	65	57	57	55	73	78	78	12
Courser	26	65	65	66	56	57	57	77	78	79	12
Huguenot	28	67	65	67	58	57	58	78	79	81	21
Ludwig	36	63	63	62	58	58	57	78	80	81	31
Herald of the Morning	26	64	64	65	57	56	54	76	77	82	8
Seaman's Bride . .	26	64	63	63	57	58	57	80	85	88	16
M. Howes	36	66	65	61	56	57	57	81	84	85	15
Means	27.3	64.6	64.0	64.6	56.5	57.0	56.5	77.7	78.2	81.8	18.3
APRIL.											
Simoom	29	65	65	68	56	56	56	76	79	85	14
Sea Serpent . . .	21	65	66	66	56	57	57	77	79	81	18
Stag Hound . . .	30	65	64	78	55	55	56	79	80	78	12
Golden Racer . . .	21	55	57	64	57	57	55	75	82	86	19
Paragon	36	62	63	67	56	56	57	81	82	79	16
David Baxter . . .	33	61	63	63	57	57	57	80	80	80	12
Herculean	39	65	64	78							15
Sword Fish . . .	19	57	60	64	58	58	58	83	86	87	17
Astrea	38	57	57	59	57	57	57	81	82	83	21
Gov. Morton . . .	30	62	63	67	56	56	55	79	81	84	11
Burlington . . .	39	62	65	63	57	58	58	80	80	80	15
Francisco	35	63	65	65	56	56	57	77	80	82	28
Cornelia L. Bevan .	36	60	65	66	57	56	56	79	81	78	16
Polynesian	30	64	66	65	57	57	55	78	80	82	15
Cynthia	35	65	66	68	57	58	56	75	80	84	17
Means	31.4	61.2	63.3	66.3	56.5	56.8	56.4	78.3	80.8	82.0	16.4

Cape Horn Crossings—Continued.

NAME OF VESSEL.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN.			LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN.			LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN.			FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
		50° S.	53° S.	56° S.	67° W.	71° W.	75° W.	55° S.	53° S.	50° S.	
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
MAY.											
Surprise	24	63°	64°	66°	58°	58°	59°	79°	79°	84°	22
Competitor . . .	24	64	64	67	56	57	56	79	80	78	15
Empress of the Seas	27	65	65	65	56	57	57	80	80	85	13
Houqua*	31	64	63	65	57	58	58	81	82	83	29
Parthian	25	63	64	67	56	58	58	79	80	81	13
Climax	23	61	65	67	56	56	56	76	78	79	12
Sirocco	34	64	66	67	56	57	58	79	82	80	20
Archer	33	64	64	66	57	57	56	82	84	84	23
Robt. Harding* . .	33	66	65	65	57	58	55	75	78	78	26
Seaman's Bride . .	26	64	63	66	57	58	56	81	81	81	15
Lantao	27	67	67	71	56	56	57	79	79	80	11
Hampton	37	65	65	66	57	58	56	78	79	80	21
Hugh Birckhead .	34	64	65	67	56	58	58	77	78	79	23
Rosario	28	64	64	65	57	58	56	81	81	81	19
Roscoe	29	65	65	65	57	59	58	81	81	82	22
Jas. H. Shepherd .	40	66	68	†							
Eliza Thornton . .	45	64	65	67	57	59	57	78	79	79	23
Benj. Howard . .	30	64	64	67	57	57	57	79	82	81	23
Mary Annah . . .	29	63	64	63	57	57	57	77	80	82	36
Storm King . . .	31	64	64	65	57	58	57	78	79	79	16
Catharine	40	64	65	64	57	56	58	77	77	78	21
Santiago	27	65	66	66	57	57	57	79	79	80	16
Matanzas	32	66	66	65	57	57	56	78	77	83	29
R. B. Forbes . . .	28	64	64	65	57	57	57	79	82	86	15
Surprise	21	62	65	64	57	57	56	77	80	82	18
Means	29.7	64.0	64.7	65.5	56.7	57.3	56.9	78.6	79.8	81.0	19
JUNE.											
Staffordshire . . .	25	62	66	66	56	56	53	73	77	79	14
White Squall . . .	24	64	63	65	57	56	56	76	79	78	11
L. P. Foster* . . .	43	67	67	70	56	56	58	83	83	85	20
Finland	41	64	63	64	57	57	56	81	87	90	14
Golden Era . . .	29	65	65	65	59	59	56	78	79	80	28
North America . .	20	54	58	61	57	58	54	75	78	80	23
Cohota	27	64	64	63	58	58	56	78	81	84	18
Flying Cloud . . .	27	67	65	66	56	55	54	73	76	78	09
John Land . . .	26	64	63	65	57	58	57	80	80	85	15
Uncle Toby . . .	32	65	65	65	58	58	57	78	80	86	13
Hornet	25	63	65	64	58	59	58	79	79	79	14
Channing	38	66	66	65	57	57	57	‡			15
Oxnard	33	65	66	67	57	57	57	78	78	79	11
Amazon	36	63	63	65	57	59	56	79	80	85	15
Linwood	32	65	65	63	56	56	57	80	83	83	19
E. C. Sronton* . .	42	65	66	64	57	58	57	79	81	81	27
Mayflower	30	65	65	67	57	58	56	77	80	86	14
Cleopatra	27	62	64	66	57	58	58	80	83	86	16
Celestial Empire . .	30	64	63	63	56	56	56	78	78	79	18
Means	29.5	63.6	64.0	64.7	57.0	57.3	56.7	77.7	78.6	82.3	15.7

* Not included in the means. † Through the Straits of Magellan. ‡ No observations.

Cape Horn Crossings—Continued.

NAME OF VESSEL.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN.			LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN.			LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN.			FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
		50° S.	53° S.	56° S.	67° W.	71° W.	75° W.	55° S.	53° S.	50° S.	
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
JULY.											
N. B. Palmer . . .	22	56°	55°	67°	57°	58°	56°	77°	78°	78°	19
Southerner . . .	25	64	63	64	56	57	58	83	81	79	26
A. Buckman . . .	37	66	66	68	56	57	56	76	77	80	14
Senator	19	64	65	65	57	57	56	77	80	81	18
Queen of the East .	30	63	63	61	56	56	55	77	78	79	23
White Squall . . .	22	64	64	65	56	58	58	78	79	80	18
Ellen Noyes . . .	28	55	56	64	58	58	57	77	78	79	21
Flying Cloud . . .	23	66	65	68	56	56	55	73	78	80	7
Rome	33	55	55	61	57	56	55	76	79	80	24
Victory	26	57	55	66	57	57	56	76	80	84	17
Levanter	35	64	65	65	56	56	56	77	79	81	16
Atalanta	39	65	65	68	56	56	54	76	77	80	18
Belle of the West .	29	66	65	62	58	57	57	79	82	82	19
Anglo-Saxon . . .	31	57	59	60	60	59	59	86	88	88	26
White Squall . . .	27	64	63	65	57	58	58	79	80	81	18
West Wind . . .	34	64	64	67	57	56	55	73	76	78	13
Cyane	38	61	64	62	57	57	57	80	82	81	23
Avondale	31	55	56	60	57	56	56	78	81	86	30
Sarah Boyd . . .	47	63	67	66	56	57	56	78	80	79	19
Reindeer	34	59	63	65	58	56	57	79	81	80	22
Golden State . . .	23	58	63	66	58	59	56	76	78	80	19
Means	29.3	61.2	60.7	64.4	57.0	57.0	56.0	77.6	79.6	80.8	19.5
AUGUST.											
E. Mallory	35	63	65	67	57	57	56	78	79	88	13
Pelican State . . .	31	65	66	64	57	57	56	76	82	83	20
White Swallow . .	30	64	63	63	57	58	57	76	76	79	17
Corinne	38	64	65	63	59	60	59	81	84	85	21
Wild Ranger . . .	27	62	63	64	57	57	55	76	77	80	17
Mermaid	31	65	65	65	57	57	57	78	79	80	13
Samoset	29	62	64	64	57	57	57	78	80	83	12
Fenelon	40	63	67	65	56	57	55	75	76	81	18
Union	28	64	65	63	57	58	58	78	81	84	13
Carioca	31	65	64	64	56	58	56	77	81	84	11
Flying Dutchman .	23	64	64	66	57	57	56	79	83	86	8
Greenwich	42	65	65	66	57	57	57	76	77	80	18
Young America . .	24	64	65	66	57	56	56	77	80	83	8
John Bertram . .	25	66	66	67	57	56	57	79	83	86	14
Rubicon	37	64	65	66	57	57	57	78	80	80	17
Horsburgh . . .	31	63	62	63	57	56	55	75	80	81	21
Harrisburg . . .	36	60	67	66	57	57	55	76	78	79	18
Kate Hays . . .	38	63	66	66	58	57	57	76	81	82	19
Winfield Scott . .	37	58	59	60	57	57	56	72	81	81	25
Windward	28	59	63	61	58	59	57	79	83	84	22
F. P. Sage	37	62	64	66	57	56	55	78	81	83	16
Sandusky	37	65	65	67	57	57	57	78	79	81	26
Sunbeam	33	66	66	65	57	58	55	76	80	80	22
Means	32.5	63.3	64.6	64.6	56.8	57.1	56.3	77.5	80.0	81.9	17

Cape Horn Crossings—Continued.

NAME OF VESSEL.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN.			LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN.			LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN.			FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
		50° S.	53° S.	56° S.	67° W.	71° W.	75° W.	55° S.	53° S.	50° S.	
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
SEPTEMBER.											
Albany	32	63°		66°	56°	56°	55°	75°	77°	79°	16
Z. D.	37	67	67°		57	56	57	71	80	81	18
Sarah Snow	38	65	65	65	57	59	60	79	81	82	17
Carrington	28	65	65	66	57	58	56	82	83	83	21
Defiance	32	65	67	70		56	56	85	84	83	22
Eagle	23	51	54	59	57	59	61	83	84	85	18
Queen of Clippers	26	65	65	65	56	56	55	76	80	82	12
John Bertram	25	65	66	67	57	56	57	79	85	86	14
Sovereign of the Sea	19	64	66	67	56	56	56	78	78	79	9
Jamestown	21	64	65	66	56	57	57	79	82	83	17
Comet	18	65	65	66	57	58	57	83	84	84	29
Trade Wind	20	65	65	65	57	58	59	82	84	85	24
Whistler	24	63	64	65	56	56	56	78	79	81	10
Hurricane	21	65	65	64	58	56	57	78	78	83	25
North Wind	21	65	66	66	57	57	58	79	79	78	29
Raven	19	64	63	64	57.	58	57	81	82	83	26
Wild Duck	23	65	66	65	57	57	56	79	82	84	23
Arab	36	65	64	65	59	58	59	78	81	84	39
Wisconsin	33	64	66	66	58	59	59	84	84	84	40
Hero	29	63	64	67	57	56	55	77	83	83	20
Kremlin	29	65	65	66	57	56	55	73	81	81	11
Means	26.4	64.2	65.0	65.7	56.6	57.0	57.0	79.1	81.3	82.4	20.9
OCTOBER.											
Seaman	20	65	65	69	55	57	58	77	76	77	24
Louis Philippe	30	63	64	65	56	56	58	76	78	80	22
Sea Witch	20	64	64	67	56	56	55	77	79	80	14
Typhoon	21	64	65	66	56	57	56	76	79	77	10
Raven	18	64	66	69	56	56	56	76	82	80	19
Schooner Clifton	49	64	64	66	57	57	57	81	82	82	16
S. D. Horton	27	66	66	66	57	59	57	80	76	80	33
Matilda	41	65	64	67	56	58	58	76	78	79	32
Samuel Russell	26	64	65	68	56	57	57	78	78	79	15
Winged Arrow	21	67	67	67	56	57	58	84	83	83	20
Mandarin	20	64	64	66	57	56	58	83	84	83	22
Witch of the Wave	19	63	65	66	56	59	61	85	87	87	19
John Wade	21	63	64	66	57	56	57	87	95	97	15
Wizard	14*	65	65	66	57	56	56	77	82	86	12
Means	25.6	64.6	64.8	66.7	56.2	56.3	57.3	79.4	81.0	82.3	19.5

* From Rio.

Cape Horn Crossings—Continued.

NAME OF VESSEL.	FROM PARALLEL OF ST. ROQUE TO 50° S.	LONGITUDE OF CROSSING PARALLELS EAST OF CAPE HORN.			LATITUDE OF CROSSING MERIDIANS SOUTH OF CAPE HORN.			LONGITUDE OF CROSSING PARALLELS WEST OF CAPE HORN.			FROM 50° S. IN THE ATLANTIC TO 50° S. IN THE PACIFIC.
		50° S.	53° S.	56° S.	67° W.	71° W.	75° W.	55° S.	53° S.	50° S.	
	Days.	Long. W.	Long. W.	Long. W.	Lat. S.	Lat. S.	Lat. S.	Long. W.	Long. W.	Long. W.	Days.
NOVEMBER.											
Thomas W. Sears .	28	65°	66°	65°	59°	58°	56°	77°	81°	85°	21
Monsoon	21	63	67	67	56	58	59	78	78	80	17
John Wade . . .	20	64	64	67	56	57	56	76	78	82	17
Senator	20	63	65	63	57	57	56	76	78	81	24
Revere	24	53	56	66	57	57	59	78	80	83	17
Tigris	30	62	64	65	56	58	59	79	81	82	18
Fanchon	31	64	65	64	57	56	55	75	77	79	22
White Squall . . .	28	65	65	66	57	58	54	73	78	81	23
Comet	20	65	65	66	56	58	56	76	81	84	12
Delegate	26	65	66	69		57	57	78	79	81	22
Manchester . . .	23	62	63	62	56	57	57	79	81	81	24
Ann Maria . . .	30	63	64	62	57	58	58	82	82	83	28
Morning Light . .	21	65	66	66	56	57	57	78	83	83	24
Edwin	31	64	64	65	57	58	58	78	81	81	24
Skylark	20	63	65	64	56	56	56	76	77	78	20
N. B. Palmer . . .	21	65	66	66	57	58	59	79	80	80	18
Onward	26	63	65	64	57	58	58	80	81	80	28
Winged Arrow . .	23	63	67	66	56	56	56	76	79	78	18
Bald Eagle . . .	18	64	65	64	57	58	57	77	78	81	19
Sam'l Russell . . .	16	64	65	65	57	58	58	80	81	81	14
Unknown	22	63	64	64	57	57	56	78	77	79	19
Parthenon	29	63	64	65	58	59	58	78	79	81	24
Kate and Alice . .	32	64	64	65	58	58	57	77	78	77	21
Means	24.3	63.3	64.8	65.1	56.7	57.2	57.1	77.3	79.4	80.0	20.6
DECEMBER.											
Westward-Ho . .	21	63	66	64	57	56	55	73	80	82	13
Anstiss	24	62	64	64	58	57	56	80	81	79	18
Flying Fish . . .	24	64	65	66	55	56	55	74	76	79	7
John Gilpin . . .	19	64	65	66	57	56	57	79	83	84	11
Wild Pigeon . . .	23	65	65	66	56	56	56	79	82	85	16
John Jay	30	65	64	64	56	57	56	76	79	79	19
J. E. Donnell . . .	34	61	63	65	56	56	55	77	78	79	13
George Raynes . .	26	64	64	65	56	56	55	75	78	80	11
Tigris	30	62	64	65	56	58	59	78	80	82	18
Seaman	23	62	65	66	57	57	54	75	75	78	12
Adelaide	29	61	64	66	58	58	56	78	79	79	19
Westward-Ho . .	21	66	66	65	57	56	56	78	80	82	24
Franconian . . .	28	62	63	63	57	57	57	81	83	83	19
Cyclone	22	54	56	60	59	59	56	78	81	82	18
Sam'l Lawrence . .	25	63	64	65	57	57	56	76	77	78	15
Golden City . . .	22	65	65	67	57	57	56	76	77	79	10
Ringleader . . .	21	64	65	64	58	58	58	78	79	80	12
Arthur	32	66	65	66	57	58	56	80	80	80	19
Eureka	25	65	66	66	57	58	59	86	85	86	18
Squantum	28	65	66	66	57	57	57	76	77	79	19
Means	25.3	63.1	64.2	65.4	57.4	57.0	56.0	77.6	79.5	80.7	15.5

There are some ships whose passages, to latitude 50° in the Atlantic, are too long to be taken into the average. They make such bad time as to constitute an exception from the generality. Such is the A. F. Jenness, with her 44 days in February. She, it will be recollected, is among the September (p. 464) crossings to St. Roque. Her time then, from the United States to the line, was 77 days; and in the count there, her performance, because it was out of all rule, was rejected from the means.

From the parallel of Cape St. Roque to the parallel of 50° south, at the usual crossing-place for the Cape Horn trader, is about 2,900 miles—not quite the distance from New York to Liverpool. And the most striking feature in this table is perhaps the length of the time between these parallels.

The distance from the average crossing of 50° in the Atlantic to the average crossing of the same parallel in the Pacific, after having doubled the cape, is nearly half the distance from the St. Roque parallel to the Atlantic crossing of 50° south; and the time occupied around the cape is nearly in the same ratio.

The average distance, made good against the current around Cape Horn, is 80 miles a day. The average distance from the parallel of St. Roque to that of 50°, through a mild climate, and with no such opposing current, is 104 miles the day. And the average distance made good by the "liners," *from* Liverpool to New York, is 95 miles a day; *to* Liverpool, the average (made good) is 135 miles.

These Cape Horn crossings are derived from the mean of 220 passages taken at random; and they give us, it may be supposed, what may be finally considered as a *fair* average; for it really differs less than a day from the average as stated in the sixth edition of this work, from the mean of 125 cases. So it appears that the passage from England to New York, under canvas, in the winter time, is nearly as difficult as the passage around the Horn.

Navigators are recommended to give these tables an attentive examination, for they are instructive. January is a good month from St. Roque around the Horn, being 40.6 days. February is three days longer, the difficulty lying between the parallel of St. Roque and that of 50° south. March is still worse, the passage then being aggravated by the difficulties from the parallel of 50° in the Atlantic to 50° in the Pacific. April is worse than all, and here the difficulty lies chiefly from St. Roque to the parallel of 50°, the average of that part of the passage being a week or 23 per cent. longer than it is in January. From June to November, the doubling of Cape Horn is most difficult, the monthly average being between 19 and 20 days from the parallel of 50° on one side, to the same parallel on the other. The best months for doubling it are from December to April, inclusive, the average being 16½ days.

On the other hand, August gives the largest average from the parallel of St. Roque to that of 50°, and November the smallest. From February to August, inclusive, the monthly mean for this part of the route is 31 days, while, for the five other months, the average is six days less. Thus it ceases to be any longer a matter of opinion, for actual experience has decided that, as a rule, the months of the least daylight give the longest passages from Cape St. Roque around the Horn.

It is, however, useless to go into any further discussion of this table here. Every navigator can do that for himself. It is only necessary to call his attention to the very tedious time generally, which navigators have from the parallel of St. Roque to that of 50° S.; how nearly all vessels pursue the same

route; and how those vessels that go east of the Falklands, though they reach 50° sooner, lose all they gain in getting west after clearing those islands.

Take, as an instance, the eight ships which did this in July. Their average time to 50° south in the Atlantic was 28, and thence around the Horn 22 days—total 50. The average of the thirteen inside ones for that month is 30 and 18 days—total 48, or a gain of two days by passing inside of the Falkland Islands.

These tables afford the navigator, who is running for a quick passage, fresh points of departure in the middle of the ocean. Here he can compare his progress with the progress made by those who have preceded him at the same season of the year, and see how much he has to gain to come up with the foremost among them, or how much he has to spare, and still hold his own with the best of them.

THE STRAITS OF MAGELLAN.

Many of the vessels engaged in the *coasting* trade of the United States have now to pass these straits or Cape Horn on their way to and fro between the Atlantic and Pacific parts of the country. Steamers will always find it to their advantage to pass through the straits.

"In them," says a brother officer, after having made the passage through in 83 days under canvas, "the winds and weather are more moderate; the sea smooth; the anchorages good and safe; the tides, taken at the right moment, an important auxiliary; and, with proper care and lookout, and rigid adherence to the Sailing Directions and Charts of Captains P. P. King and Fitzroy, R. N., excepting where changes have naturally taken place, the dangers are of little importance.

"The head winds in the western reaches present the greatest obstacles; and, in my opinion, it is at Cape Isidro or Cape Froward that the difficulties commence. The almost perennial strong westerly winds form the only objection to the navigation of these waters."

Among the many expedients to which the dangers of the sea compel vessels to resort, or among the emergencies which spring up from the business of commerce, sailing vessels, and especially small craft, may now and then find it to their advantage to take to the straits. As a rule, however, it is *the* route for steamers, and for the benefit of all such, I give the following sailing directions. They were prepared by Thomas S. Phelps, Master U. S. N., and are formed on information derived by him while on board the U. S. S. Decatur, of which vessel he was the master when she made the passage through. This report was addressed to the commander of the vessel, and so much of it as relates to steam navigation is subjoined:—

U. S. Sloop of War Decatur,

Valparaiso, Chili, *January* 20, 1855.

"Sir: I respectfully submit the following report, containing information calculated, in my opinion, to facilitate the navigation of the Straits of Magellan, founded on actual observation during the passage of the

U. S. sloop of war Decatur, under your command, from the Atlantic to the Pacific Oceans, during the months of October, November, and December, 1854.

I think that, for a fast sailing, weatherly ship, the passage would average from twenty to twenty-five days. [She would, therefore, lose time by attempting the straits, for the average time from 50° S. in the Atlantic, around the Cape, to the same parallel in the Pacific, is only 17 days. M.]

I can discover no reason why a steamer of *any* class should ever go round Cape Horn, as the average passage through the strait need not be more than three or four days; besides, the facilities for wooding and watering are very great. The coal mines near the Chili settlement, with little trouble, force, and expense, could be advantageously worked, and would yield all the fuel required.

All the bearings, ranges, &c., given are magnetic, unless otherwise stated. The variations, as laid down by Captains King and Fitzroy, are to be relied on implicitly.

Soundings North of Cape Virgins.—From ten to twelve miles north of Cape Virgins, and from five to eight from the land, there are between 37 and 43 fathoms water, with the bottom of blue mud, which changes to coarse sand and gravel farther south.

Eastern Entrance of the Strait.—After making Cape Virgins, should the wind be stormy from S. W., W., or W. N. W., it would be well to run in, and anchor near the land, where the sea is smooth, and wait till the wind moderates sufficiently for proceeding.

Cape Virgins may be passed in safety, at from one and a half, to two and a half miles distant. We crossed Sarmiento Bank, two and a quarter miles from the cape, sounding in 10 fathoms, sand, shells, pebbles, and slate: tide about one quarter flood. I know nothing of Sarmiento Bank, to the southward and eastward of the above limits; changes may, and probable have, taken place, and vessels should avoid it, until it can be examined.

When past the reef, which makes out from Cape Virgins, stand along the land or S. by E., until Cape Possession is well open with Dunginess, when the course to the westward is clear. I have been informed by Captain Sweeney, of the American Merchant Marine, and the captain of the French war steamer Catinat, that Wallis Shoal no longer exists, they having sought in vain for it.

After passing Point Dunginess, should the wind be ahead, and the tide flood, stand out into the main stream, where there is 40 fathoms, and there will be little difficulty in working up to Possession Bay; but, if the tide is ebb, it would be well to anchor under Dunginess until it turns.

If it blows a gale from S. W. to N. W., a vessel should anchor under Dunginess, where she can ride it out in safety, instead of running out to sea, which I believe has frequently been the case, and thereby losing much time, and magnifying the dangers of the entrance.

Good anchorage, may be had along the coast, between Point Dunginess, and two miles northeast of Cape Possession, in from 12 to 18 fathoms water, and about one mile from the shore. Should it be necessary to run from these anchorages, a position can easily be taken up under Dunginess, or, if desirable, run down the Main Channel, south of Sarmiento Bank, out to sea.

Possession Bay.—Do not anchor in Possession Bay, unless it be near the cape or south of Narrow Bank; the ground is said to be foul.

Thus far all the points are well marked, and easily distinguished, excepting the point of Cape Possession, when to the southward and westward of it. A good rule to be adopted, when running for the First Narrows, is, not to go inside of 16 fathoms.

Narrow Bank.—On approaching Narrow Bank for an anchorage, to await the tide or otherwise, care must be taken not to have the centre of North Direction Hill bear more southerly than S. W. by W.; for on that bearing with Mount Aymond N. W. ½ W., to N. W. ¾ W., the water shoals suddenly from 21 to 6 fathoms. There has evidently a large flat made between the above bearings and Narrow Bank proper, since it was surveyed.

I have no idea of the extent of this flat; we made two tacks on it, and the least water found was 6 fathoms, and the greatest depth, 7¼ fathoms, sand. There probably is good anchorage here, with plenty of room.

With North Direction Hill (centre), bearing W. S. W., and Mount Aymond N. W., there is good anchorage in 21 fathoms, from which position the course S. S. W., through the Narrows.

Of Orange Bank I can say nothing; we approached it once, and the soundings instantly indicated it.

In selecting objects for cross bearings, North Direction Hill and Mount Aymond are to be preferred to Cape Possession and Orange Peak.

Near the entrance to the First Narrows, on Delagado Bank, is the wreck of the yacht Northern Light; which, if the weather is clear, serves as a good mark for the entrance.

First Narrows, &c.—With a flood tide there is no difficulty in the First Narrows; after emerging, should the wind fail, anchorage may be had in from 10 to 14 fathoms, between Baranca Point, and Triton Bank, taking care to avoid the kelp near the north shore. Here, as in every other part of the strait, it is difficult to discover kelp until it is close aboard, unless it is anchored in thick masses, floating, or the weather is calm. There is no danger in passing south of Triton Bank.

At our anchorage near Triton Bank, and opposite the Narrows, the tide set by us at the rate of two and a half knots per hour; while in the Narrows, we certainly had no more than three knots per hour.

Gregory Bay.—When clear of Triton and Kelp Banks, steer for the highest peak of the sand hills, which form Cape Gregory, and when the extremity of the cape bears S. S. W., or a better mark when Capes St. Vincent and Gregory close, you are in 17 fathoms, with clay and shells, which is a good anchorage; or you can stand on till within one-third of a mile from the shore, and anchor in 6 or 7 fathoms, clay. This is an excellent anchorage, and with good ground tackle one need not fear any wind.

The anchorage, recommended by the surveyors, is about two miles to the N. E., abreast of the extreme northern slope of the sand hills. Be careful in approaching the land between the two anchorages, for there is a sand-spit which makes out some distance, perhaps a quarter of a mile or more.

The observatory of Capt. King was on the highest peak of these sand hills; the bush, which he mentions, has been destroyed.

Second Narrows.—On leaving Gregory Bay, take advantage of the flood tide, stand out into the channel, taking care not to pass an imaginary line drawn from Cape Gregory to Point N. S. de Gracia, and there is neither danger nor difficuly in the Second Narrows. The south shore is bold close to. We experienced more current here than in any other part of the strait. If a vessel should be caught in a heavy gale here, there is little danger, as she can easily regain an anchorage in Gregory Bay.

Royal Roads.—Anchor anywhere in Royal Roads to the northward of the shoal between Elizabeth Island and Pecket's Harbor, which I call Royal Shoal; the ground is good, tenacious clay, the depth moderate, and there is but little tide.

Between the N. E. end of Elizabeth Island and Royal Shoal, and half a mile from the former, there is good anchorage in 7 fathoms, clay. The tide sets constantly to the eastward, which prevents a vessel from tailing towards the shore. This is an excellent position for awaiting an opportunity for passing down the south side of the island. Water could be procured here by digging wells in the clay banks. Muscles, wild celery, and game abound.

One-eighth of a mile from Sylvester point, there is 7 fathoms; and at about one hundred and fifty feet from 2 to $2\frac{1}{2}$ fathoms, with much kelp. A vessel can go close to this end of the island without danger. When it is flood tide, the "ripples" are very heavy, and would induce a stranger to imagine himself near a dangerous reef. No bottom was found in the "rips," with 40 fathom line out.

In selecting an opportunity for passing down the south side of Elizabeth Island, ebb tide I think is to be preferred to the flood (in either case a commanding breeze is necessary), the danger of drifting on Santa Martha and Magdalena or Wallis Shoal, is entirely removed, and there is little or none of being set on Elizabeth Island; the tide flows up from the southward against the north shore, and close in forms an eddy to the southward and westward. Should, however, a vessel drift too near the island, she could anchor close in, and await a wind to enable her to proceed.

Keep close to the island; the lead will be the best guide for approaching the shore. When clear of Wallis Shoal, "steer for Laredo Bay," or down the coast. Cape Negro is easily distinguished, forming a high black bluff on the north side of Laredo Bay.

Laredo Bay and Shoal.—Laredo Bay is a safe and snug harbor with good holding ground. Off the south point, a "Flat" extends out to the eastward, as near as I could judge, about one and a half miles, with 3 fathoms on it. I sounded to within one-eighth of a mile from the shore, and 3 fathoms was the least water found.

To enter Laredo Bay from the southward, keep Porpesse Point and the S. W. end of Elizabeth Island a little open (which will clear the shoal), until the centre of the bay bears W. S. W, when steer that course until well in, and anchor in 5, 6, or 7 fathoms. The north shore is bold close to, and one-fourth of a mile from the N. W. point is an excellent anchorage, with the bottom of tenacious clay. This place possesses no facilities for wooding or watering, but there is an abundance of game.

On leaving, stand out E. N. E. till the above range is on, when the course to the southward is clear.

Catilina Bay.—There is good anchorage in Catilina Bay from one-half to one mile from the shore, on

clay bottom; the lead is the only guide for approaching the land. Five miles south of Laredo Bay the country is thickly wooded.

Rather more than three miles north of the extreme end of Sandy Point (Punto Arenas), there is a small stream of most excellent water, which can be easily procured. By leading a hose from a small cascade to the boat, casks can be filled in a few minutes without the trouble of disembarking them. Wood is also easily obtained. About one-eighth of a mile south of the stream there is a small inlet, affording a good harbor and landing for boats.

Sandy Point.—On passing Sandy Point, give it a berth of at least one and a half miles, for a shoal extends out to the eastward *fully* one mile. A large pyramidal buoy will soon be placed on this shoal, in four fathoms water, at low tide. It will be painted black, with the depth of water, in fathoms, marked in white on each side.

Chili Settlement.—Chili Settlement, in the Territory of Magellan, and Province of Punto Arenas, is situated about three miles to the southward and westward of the extremity of Sandy Point, where the trend of the land turns suddenly to the southward.

It consists of about eighteen buildings, including a church, storehouse, carpenter's and blacksmith's shops. The inhabitants number about one hundred and forty.

From six to nine miles back in the country, there is an extensive coal mine, which, in a few years, will probably render this place an important station; for the Strait of Magellan must, sooner or later, become the great thoroughfare for steamers from the Atlantic to the Pacific Ocean, unless a canal is made across the Isthmus of Darien.

The anchorage is exposed from east to S. S. W.; the ground is good, and there is six fathoms water, to within one-fourth of a mile from the shore, with the flagstaff bearing N. W.

On approaching or leaving the anchorage, care must be taken not to ground on the 'Spit,' which makes to the southward and eastward about one-fourth of a mile, and is formed by a river which disembogues at this place. The 'Spit' is about three-fourths of a mile to the eastward of the town.

The anchorage to the north of the point is superior in every respect to the one on the south side; it is more protected, wood and water are more easily procured, and there is no difficulty in their embarkation; whereas, at the settlement, with south and southwesterly winds, there is much, and frequently, a dangerous surf.

From Sandy Point to Port Famine.—Between these two places, keep well on the west shore, and watch the squalls which blow from the land close by. By keeping well out in the stream, there appears to be considerable northerly current, and the wind varies so frequently that it is difficult beating.

Avoid Rocky Point. I have been informed that a shoal extends out about one mile.

Port Famine.—For any class of vessels, Port Famine is a safe, convenient, and well protected harbor, with muddy bottom. There is no difficulty in entering or leaving, unless the wind fails. Kelp extends off about one hundred and fifty feet from Point Santa Anna, which should be avoided. I have been informed that there is a dangerous rock in it, near the point.

In the second cove to the northward and westward of Point Santa Anna, excellent water is easily procured, by digging wells at the edge of the bank. The beach is strewn with drift-wood, which makes excellent fuel; besides this, the facilities for wooding are not good, although there is plenty of it.

Steamboat Cove is a snug little bay, which might be serviceable for small vessels, when unable to reach Port Famine; it would be better for them to anchor here, than to remain under way all night.

There is no difficulty in recognizing Point Santa Anna. Of the clumps of trees on the point, mentioned by Captain King, R. N., a large number have been cut down; but enough remain to serve as a mark; near them is a house conspicuously placed, and, on the higher lands, the cemetery and ruins of the settlement still remain, which alone are sufficient to indicate the place.

Port Famine to St. Nicholas Bay.—In sailing from Port Famine to Cape Isidro, with a westerly wind the squalls are very severe. Mount Sam, of which Cape Isidro is the southeastern point of its base, has several deep gullies, where one is almost certain to meet with furious 'Willie Waus.' With westerly winds, Cape Isidro is difficult to pass, but when once round, a ship can work to windward very well as far as St. Nicholas Bay, by keeping on the north shore and taking advantage of the slants. The harbors in this vicinity are easily distinguished.

St. Nicholas Bay.—The peak of Noadales and Nassau Island are sufficient marks for the locality of this bay. It is an excellent harbor, the ground good, and, to the eastward of the islet, from 6 to 8 fathoms, mud and sand, will be found until close in. Soundings will not be obtained until nearly between the islet and the eastern point of the harbor, when the depth changes suddenly from 50 to 7 fathoms. There is plenty of room on both sides of the islet, but less water than when the place was surveyed.

Snug Bay.—A small green islet is the distinguishing mark for this bay. It is the first harbor to the westward of Cape Froward, and five miles from it. It is a fine capacious bay, with a sand beach—two rivulets emptying into it. To the eastward of the islet and ridge of rocks, extending from it to the shore, in a northwesterly direction, there are from 6 to 8 fathoms all over the bay, until close in. The water shoals suddenly from 17 to 8 fathoms, and soundings will not be obtained with a hand lead till the islet bears about N. W. by W. ½ W.

On entering Snug Bay, give the islet a berth of one-fourth to three-fourths of a mile, passing to the eastward of it; from one-quarter to one-half of a mile is the best; and when the rock to the northward and westward of the isles is in range with the centre of the mount which forms Cape Holland, there is 8½ fathoms.

When the above mount is between the rock and western point of the bay, or the former is closing with the latter, there is 7 fathoms, which is probably the best anchorage, as it is well protected from east round by north to southwest.

When the southern point of Cape Holland is in range with the western point of the harbor, there are six fathoms, and about a cable's length further, four fathoms.

The bottom is composed of clay, sand, and broken shells.

Owing to the high precipitous mountains with which the bay is surrounded, it appears much smaller

than it really is; which is the probable reason why navigators have passed it by so lightly. It is formed very much like the Bay of St. Nicholas.

Wood's Bay.—Wood's Bay is inferior to Snug Bay in size, and also as an anchorage. There is no difficulty in entering or leaving, and it is a good stopping place. Wood and water are easily procured. There is a large stream emptying into the bay, and a little to the eastward of it there is a small brook of good water. It is not advisable to go much inside of 8 fathoms, as the water near the shore shoals—suddenly from six to four and one fathoms.

By anchoring to the eastward of the river, and avoiding the kelp in front of the shore sufficiently to allow a vessel to veer, a good berth will be secured. Bottom, fine sand.

On entering or leaving Wood's Bay, when the following points are in range with Cape Holland, the corresponding depths will be found:—

The south point of Charles Island	8½ fathoms.
North " " "	12 "
Monmouth Island	13½ "
Charles Island open about its length	15 "

And when the south point of Charles III. Island is in range, there is deep water.

Corde's Bay.—When unable to reach Fortescue Bay, Corde's Bay is a very good and convenient anchorage. Ten to six fathoms, with occasional kelp, will be found from one-half to one mile from the shore.

Directions for Anchoring.—Stand in about half way between Muscle Island and the west point of the bay, off which there is a large mass of kelp; and when between the island and point, or when the most southern point of land between Fortescue and Corde's Bays is in range with Monmouth Island, anchor in 7 fathoms, clay, sand, and shell, and there will be plenty of room to veer. I found 6 fathoms close to Muscle Island, and the rocks to the southward and eastward of it, and 5 fathoms in the edge of the kelp off the western point of the harbor.

If the weather is mild, you can anchor outside as soon as you get six fathoms. The bottom is clay and pebbles under sand.

Fortescue Bay.—Fortescue Bay is a good anchorage in every respect, and equal to any in the strait; it is entirely devoid of danger, and the shore is bold close to. Good anchorage will be found wherever there are from 7 to 12 fathoms, giving the ship sufficient room to swing, and to veer cables if necessary. The bottom is composed of mud and sand.

By bringing Wigwam Island to bear N. N. W., and steering for it until in 7 or 6 fathoms, the anchorage recommended by Captain King, R. N., will be secured.

About two or three cables' lengths from the shore in the northwestern part of the bay, in 7 fathoms, a ship will be in a very snug berth, and be well protected from the prevailing winds.

If it is desirable to wood and water, the first anchorage is the most convenient, as it is near the river on the eastern shore, opposite to Wigwam Island, where most excellent water may be procured by pulling a short distance up the stream.

Cape Gallant to York Roads.—From Cape Gallant to within about one mile and a half of Passage Point, the shore is very steep and bold close to, and there is no appearance whatever of an anchorage; but, between Passage Point and the above distance to the eastward of it, there are several beaches, composed of sand and shingle, and also two rivers. Abreast of the largest or western river, which disembogues near the middle of a long sand beach, there appears to be, and no doubt is, very good anchorage. Passage Point will be recognized by a rock a short distance from it.

We did not enter Elizabeth Bay; it appeared to be well protected and a good anchorage. When abreast of Rupert's Island, it cannot be mistaken.

York Roads.—This anchorage is easily distinguished by Woody Point, and the great width of Batchelor River. A shoal makes out from the shore about one-fourth of a mile, and from Woody Point more than half a mile, which should be carefully avoided, as the water shoals suddenly from 6 to 3 fathoms. Although the bottom is fine coral,* and very bad holding ground, there appears to be little danger of a ship's dragging; as the Decatur rode out a heavy gale of nine days' duration, and most of the time with only one anchor down.

It is an excellent stopping-place; and the shore abounds with wood, game, wild celery, and scurvy grass.

When standing into York Roads for an anchorage, bring the mouth of Batchelor River to bear half way between two remarkable distant peaks beyond the valley; steer in this range, and when in from 10 to 8 fathoms, anchor; when this position is secured, the most southern point of land on the north shore, which can be seen beyond Passage Point, and the eastern point of the Roads will be open, apparently, from one to two ships' lengths.

Tides.—The tides between Cape Gallant and Cape Quod are very strong, and exceedingly so between Passage Point and the latter place; the success of a vessel beating to windward *here*, depends almost entirely upon them.

At York Roads, on the full and change days, it was high water at 2 P. M. Nineteen westerly, and eighteen easterly tides were observed, from which data the average duration of the westerly current is six hours and seven minutes, and the easterly six hours and thirty-four minutes. The tides are not regular, owing to the fresh prevailing winds which frequently cause them to vary from one to three hours.

Byron's Shoal. Crooked Reach.—Near the eastern entrance of Crooked Reach, and about half a mile from the north shore, lies a shoal on which Commodore Byron anchored, in the Dolphin, in 15 fathoms water. A short distance to the eastward of the Dolphin's position, with Cape Quod bearing W. S. W., and Jerome Point N. by E. ½ E., there is a large mass of anchored kelp, through which the Decatur passed sounding in 6 fathoms; the rock to which the kelp is attached, being from one to two hundred feet to the eastward. Of the depth of water on this rock I have no idea, as we had no opportunity of examining it. A line drawn from the anchorage in York Roads to Cape Quod will pass about half a mile to the south-

* Was this coral living or dead? Specimens of it would have been very acceptable.—M.

ward of the kelp, and when Jerome Point bears N. N. E, a vessel bound to the westward will be past the Shoal.

Red Rock.—Excepting Byron's Shoals, this is the only danger in Crooked Reach. It appears to have been first reported by Lieutenant Simpson, who was with Commodore Byron in 1764. Again, in 1848, it was examined by the officers of H. B. M. steamship Gorgon, and by them received its name. They found five feet water on it, and Lieut. Simpson and Capt. Paynter both represent it as being well buoyed out by kelps. Four bearings were taken on it, which do not agree, and its position remained uncertain. Two of the bearings which do cross, locate it rather more than half a mile from the south shore between El Morion and Big Ortiz Islands. We examined this vicinity very carefully in a boat, and could discover no appearance of kelp or the rock. We repeatedly crossed this part of the strait, both by day and night, and no rock or anchored kelp was found.

About half way between Cape Quod and the most southern of the Ortiz Islands, and projecting some distance to the southward of a line drawn from the island to the cape, there is a large mass of kelp, underneath which I feel certain is the rock in question. This weed is a little to the northward of the middle of the strait, but in consequence of the peculiar contour of the land, and the position of the Ortiz Islands, it appears to an observer on passing, to be well on the north shore.

A vessel will avoid Red Rock by paying attention to the following directions:—

When the eastern point of Borja Bay bears N. by W., or the southern Ortiz north, the rock is to the westward; and when the north point of El Morion (a light gray perpendicular rock), bears S. S. E., the rock is to the eastward. When between the above bearings, do not go to the northward of the range of Cape Quod or with the southern point of the small island near the cape, and which lies a little to the south of west from it. Do not shut the island in, and you will be well clear of the danger. Should, however, the island be obscured by thick weather, do not bring Cape Quod to bear anything to the south of west, for the cape bears about south by west from the southern edge of the kelp.

I am confident that there are no other dangers in Crooked Reach.

Borja Bay.—Borja Bay is small, well protected from the prevailing winds, and entirely free of dangers. Two rivulets of good water empty into it, and its shores abound with wood.

The best anchorage is in twelve fathoms near the head of the bay, and to the westward of the eastern rivulet; without a leading wind it is difficult to reach this position, as there is not sufficient room for a ship to beat.

Vessels standing into Borja Bay with a westerly wind, should luff close round the kelp off the eastern end of Big Ortiz (there are fourteen fathoms in the outer edge), and if the squalls from the "Gullies" are too strong and baffling to work in, shoot over to the N. E. side of the bay, and anywhere to the westward of its eastern point; from three-fourths to one and a half cables' length from the beach there is good anchorage, in from fifteen to twenty-five fathoms, yellow clay.

There are from three and a half to five fathoms close to the shore in the kelp. The current on this side of the bay, close in, appears to set constantly to the southward and eastward.

Long Reach.—In the present unexplored state of Long Reach, the first harbor on which a ship of five hundred tons can depend for a safe anchorage, is Plaza Parda Cove, excepting, perhaps, Velena Cove, a short distance to the eastward of Guiron Bay. We passed close to it, and it appeared to be a good stopping place. Barceola and Orsono Bays should be carefully examined; for, if there is good anchorage in them, they are very convenient and of easy access.

Langary Bay, Lion Cove, Arce and Flores Bays, follow each other in quick succession; they are uninviting and too contracted for anything but a small brig or schooner.

Guiror and Glacier Bays are conveniently located, and appear to be good anchorages.

On the south shore, Swallow Bay is the only one which seems to be a good and secure harbor. Kelp extends from the island half way across the entrance, and there is a rock, a little above water, near the northeastern point of the island.

Plaza Parda Cove.—This excellent harbor will be easily recognized by its proximity to the deep Bay of Plaza Parda and Shelter Island.

The depth of water varies from 4 to 7 fathoms. There are 7 fathoms alongside the steep shores of Middle Point, and in the thick kelp on either point of the entrance, 3½ fathoms. Kelp extends nearly half way across from the western shore, but it is anchored in 5 and 6 fathoms. The Decatur anchored in 6 fathoms, sticky bottom, with kelp all around her.

The inner harbor, connected with the outer one by a channel about one hundred and fifty feet wide, is one of the most complete wet docks in the world. It is entirely sheltered from all winds, and several streams of excellent water empty into it, which can be procured without difficulty. This is an excellent harbor for a steamer or schooner. A vessel can go close alongside of Middle Point. Wood is very scarce.

Directions for Anchoring.—Stand in about half way between the east and west points of the entrance, and, when between them, anchor. By keeping clear of the thick kelp off the Point, there is, I believe, no danger but what is above water.

Near Cape L'Etoil, there is a fine bay extending to the northward nearly a mile, of which no mention is made in the Sailing Directions; at its head there is a sand beach, and every appearance of an anchorage. This would be a good harbor for a steamer, as it is convenient and well protected.

Sea Reach.—With the exception of the Harbor of Mercy, I know nothing of the anchorages in Sea Reach, as we did not visit any other. All the harbors are easily distinguished.

Harbor of Mercy.—On approaching this harbor, it appears to be merely a slight indentation in the coast, but Observation Islands serve to point it out distinctly. It is a most excellent and convenient harbor, and well deserves its name. Abreast of the islands, there are 11 and 12 fathoms, and kelp all the way across, with good holding ground.

A vessel should anchor at or near the mouth of the cove in the southwestern point of the harbor; by coming-to further out, she will be at too great a distance from the watering places, and exposed to a heavy swell.

General Remarks.—I believe that there are no dangers in the Straits of Magellan, excepting those

which have at different periods been noticed, and directions, for most of them, are embodied in the works of Captains King and Fitzroy, R. N. We certainly have had an opportunity of testifying to the truth and accuracy of their Charts and Sailing Directions, on our long passage from Cape Virgins to the Pacific.

Disregarding the wind and weather, I do not believe that there is a body of water in the world, of equal dimensions, so devoid of danger, or so easily or safely navigated.

I must again repeat, that the strong westerly winds and rains in the Western Reaches, form the sole objections to the passage of a sailing vessel from the Atlantic to the Pacific Ocean; and I would advise no square-rigged merchant vessel to undertake it on that account. For a steamer, there is no difficulty; and this is the route for them. Were a line of good tug-boats established here, few vessels would ever go round Cape Horn.

The passage from the Pacific to the Atlantic is simple enough, as the winds are fair during eleven months of the year, in the difficult reaches.

From Cape Virgins to Sandy Point, northerly and easterly winds are common, and there is but little rain; but from the latter point to Cape Pillar, westerly winds blow almost constantly, and there is seldom a day but what either snow or rain falls, between Capes Gallant and Pillar.

Between Cape Froward and Charles Islands, the Strait is from 5 to 7 miles wide, and there is plenty of room to work ship.

English, Crooked and Long Reaches are narrow and confined, varying in width from one and a quarter to two and a half miles; and in either of these, no one, unless forced by calms, should ever remain under way all night. We were obliged to pass several nights in the two latter Reaches, and I can safely assert that no one who has ever tried the experiment will care to repeat it.

Sea Reach is from seven to fourteen miles wide, and, if caught out here at night, there need be no apprehension, as there is sufficient room to work ship, and the shores are bold and high.

Nearly all the headlands in the Strait are easily distinguished.

The tides between Cape Virgins and English Reach are very regular, and it is important that a ship should take advantage of them. Between Capes Gallant and Quod they are exceedingly irregular, and it is difficult to know when it is flood or ebb in the stream. It is useless to attempt to beat against them in English Reach.

After passing Cape Quod, they are of little importance. There appears to be a current, governed by the winds, running to the eastward; as a general thing, it will not materially affect a vessel's beating to windward.

In the western Reaches every one must be prepared for some very violent squalls, frequent rain, snow, hail, and thick weather, which, however, during the day, do not much impede navigation unless it is foggy.

From Catilina Bay to Barja Bay, wood, water, game, muscles and limpets abound in nearly every

harbor on the Patagonia shore. I know but little of the Fuegian coast. To the westward of Cape Quod, the harbors will furnish plenty of water, but small supplies of wood.

I cannot close this report without expressing my thanks and obligations to the captain of the French war steamer Catinat (I regret that I do not know his name), and to Captains Sweeney and Waterman, of the American merchant service, for valuable information relating to the Straits of Magellan.

Very respectfully,

Your obedient servant,

THOMAS S. PHELPS,

Late Master of the Decatur."

Isaac S. Sterett, Esq.

Commanding U. S. Sloop of War Decatur.

THE BAROMETER OFF CAPE HORN.

In 1831, I doubled Cape Horn in the U. S. ship Falmouth. I was master of the ship, and it did not escape my attention that there were certain anomalies of the barometer in those regions. I found the barometric pressure off and about Cape Horn, not only much less than it is at the sea-level generally, but I observed that certain fluctuations of the barometric column off the Horn, did not, as in other parts of the sea, always indicate certain changes in the weather.

I communicated a paper upon this subject to the *American Journal of Arts and Sciences*,* which was published in that Journal in 1834, and from which the following extract is taken:—

"The barometer has not been found to be of much practical utility off Cape Horn; how useful soever it may be in middle latitudes, by indicating the approach of hurricanes, it is no index to the wind in the high latitudes to the south of Cape Horn. He who, in the Chinese seas, is warned by the barometer of the approaching typhoon, and can foretell the coming of a gale by the height of the mercury in it, finds that off Cape Horn the same indications are frequently followed by moderate breezes, and even by calms. Here, the mercury below the mean height of lower latitudes becomes very unsteady, falling and rising several inches in a few hours. During the strength of a gale, sometimes it is observed to rise; at other times, it falls, or remains in *statu quo*. Its mean height, south of the latitude of Cape Horn, is 29.03 in.

"As the Pacific coast of Terra del Fuego and Patagonia is approached with the wind from the westward, the mercury in the barometer ascends. When the wind is strong, it rises above thirty inches, and close under the land, with fresh westerly gales, it frequently stands above 30.50 in.

"From lat. 45°, embracing a region towards the south of twelve or thirteen degrees in breadth, the most prevalent winds are from the westward. Vessels entering this region from the south have a rise in

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* Vol. XXVI. p. 54.

the barometer, when the wind is on the land. The rise is generally observed to commence about the latitude of the cape, continuing to increase as the land is neared; and, when the winds are fresh, a greater accumulation of atmosphere is shown by a higher range of the mercury.

"The result of my own barometrical observations, compared with others to which I have had access, shows that within this region the barometer stands higher, when the winds are from the westward, than it does, *cœteris paribus*, between the same parallels in the Atlantic. The difference is nearly as 29 to 30, and increases as the land is approached. This accumulation of atmosphere is caused from the obstruction which the mountains of Patagonia, and the highlands of Terra del Fuego afford to the winds in their passage across the continent towards the Atlantic."*

According to Erman, there is a low barometer also in the sea of Ochotsk. This observant traveller mentions also a district—the basin of Lake Baikal—remarkable for its barometric anomalies, in Asia; where, in winter, there is a cloudless sky with a high barometer. This region of permanently dry and *heavy* air, is antipodal to the region of light and damp air off Cape Horn. But it is probably due to the influence of the desert and mountain ranges of Asia, which, after having extracted the moisture from it, and then withholding supplies of more, combines to disturb the general system of atmospherical circulation.

Several years (1839) after I had called attention, in *Silliman's Journal*, to the low barometer off Cape Horn, the Royal Society of England alluded to the phenomenon in their report on the Instructions for Ross' Expedition to the Antarctic Regions. They point to a remark by Captain Foster, as the first suggestion of this anomaly. The Prussians claim it for their Admiral Lütke, who observed it when he doubled the cape in 1827. I am unable to decide as to priority. I lay no claim to it; for the phenomenon was traditional among Cape Horn navigators, when I first doubled that cape. This was in the U. S. ship Brandywine, 1826; and no observant navigator can perform that voyage, without noting the low range of his barometer in those stormy regions.

My own opportunities, however, for investigating this subject in 1831, 1832, were not as good as they now are. I determined, therefore, with sea journals in abundance before me, to review the question of mean height, as well as to re-examine the opinions of navigators concerning the barometric indications as to the weather off the cape. I thereupon requested Mr. O. C. Badger, P. M. U. S. Navy, to extract, from the first Cape Horn abstracts that he should take up, the opinions therein expressed with regard to the barometer. In a little while he brought me in a number, among which but three, viz: Capt. Hull, of the Charles Mallory, Capt. Littlefield, of the Alboni, and Capt. Scott, of the Adelaide Metcalf, spoke in favor of it. Capt. Hull says: "My barometer tells the weather here to a charm." Capt. Littlefield says: "Never, in one instance, has my barometer deceived me;" and Capt. Scott remarks: "Thus far, I think, the barometer has been an infallible guide as to the weather."

I have also, since, received the following log of the ship *Queen of Clippers* (John Zerega), from New York to San Francisco.

"Sept. 2. Lat. 56° 08′ S.; long. 65° 27′ W. Barometer at noon, 28.70; temperature of air, 36°; of

* On the Navigation of Cape Horn, by M. F. Maury, P. Mid. U. S. Navy, Vol. XXVI. Am. Journ. Sciences.

water, 40°. Winds: first part, W. N. W.; middle part, S. S. W.; latter part, W. by S. Commences light winds and beautiful weather; at 2 P. M. heavy tide rips, nearly turn the ship round with the wheel hard up. At 9 P. M. light wind from S. W., wore ship. At 10 P. M., calm, squall gathering from S. S. W.; in royals, and clewed up everything except topsail and foresail; but before we got through, it struck us, and I was glad that I was so well prepared for it. It blew very hard for three hours; close reefed fore and mizzen topsails, and doubled reefed main topsail and mainsail. Latter part, heavy gales and hail; ship under the same sail. We seem to be pursued by contrary winds. (I see in your book of *Directions*, that some of the captains state that they do not consider the barometer as a guide in high southern latitudes; but I differ from them, although I may not have had as much experience as some of them, having been 13 years at sea, of which time I have been captain six years). I think, if the glass falls three or four tenths in a few hours, it is almost positive that it will be succeeded by a gale or very heavy gust, which will last several hours, although the simple fact that the barometer falls does not, as a natural consequence, predict wind; it only shows that there is a commotion in the atmosphere in your vicinity, which may be succeeded by wind or rain, but I think more likely by the former. If you would be so kind as to write me, on my next voyage, a particular track which I should follow, you would oblige me very much; also the mistake which I made on this voyage; and, if you please, I should like to hear your opinions concerning the barometer."

All the other opinions are adverse; I quote a few of them:—

"The barometer remains low all the time; it appears to be of no use here."—*D. C. Landis, ship F. W. Brune.*

"Barometer useless."—*W. L. Phinney, ship Kentucky.*

"The mercury here appears to be very lively—will rise and fall from 30.10 to 29.16 rapidly; but it is to be observed that this variation is not attended with the same degree of increase and decrease of wind that we experience elsewhere. Consider the barometer here of very little use."—*T. Dahlgren, barque Byron.*

"Barometer rising; but find it no guide whatever."—*S. M. Hudgins, barque Hugh Birkhead.*

"Barometer, unsteady; squalls the same, without any apparent effect on the barometer. I do not trust to it."—*Charles A. Ranlett, ship Surprise.*

"The mercury fell this day 1.42 in., and no wind to speak of."—*W. E. Putnam, ship Empress of the Seas.*

"I watch the barometer closely; but do not think it is to be depended on here as in the North Atlantic Ocean."—*Samuel Harding, ship Robert Harding.*

"My barometer has been almost useless since I was in the latitude of the Rio de la Plata. The heaviest gales I had, it ranged from 29.15 to 29.40, and it has been as low as 28.35 with a whole sail breeze. It has, however, invariably fallen for a northerly wind, and risen for a southerly one. It has ranged during the last six weeks from 28.35 to 30."—*Oliver H. Saunders, ship B. Howard.*

"I have never known the barometer to range so low, and know not what to make of it."—*B. Buxton, ship Union.*

"A most extraordinary fluctuation in the barometer, from 30.03 in. to 29.3 in., the weather and appearance giving no indication of storm or rain."—*Robert McCerran, ship Defiance.*

"The barometer continues to fall, although the wind is southwest. I have always seen it rise with the wind from that quarter."—*W. B. Daniels, ship Seaman.*

"The barometer ranges the highest with the wind W. S. W., and lowest from the northward. It either accompanied or followed the change, never preceded it."—*John Gillan, barque Delegate.*

"I do not see that it (the barometer) is a guide to be depended upon. Certainly, my experience, this passage, would show its fall followed by delightful weather."—*R. F. Coffin, ship Senator.*

These opinions fully sustain the opinion which my own observations and experience induced me to express twenty years ago.

The anomalies, however, of a mean low pressure were well deserving of a close investigation. I therefore requested Mr. A. A. Semmes, Passed Midshipman of U. S. Navy, to arrange from the log-books of the office the following tables, to show the average height of the barometer off Cape Horn, and in the trade-wind region north and south, both in the Atlantic and Pacific Oceans.

With regard to these tables, I should remark that the barometer has been entered in the tables without any correction whatever; and that the barometer to which the tables refer, is the common mercurial marine barometer.

Though this instrument, as at present used and constructed for the sea, abounds with sources of error, there is but one of the errors arising from the many sources, for which the correction may be applied on board ships, and that is for temperature.

Every navigator knows that mercury is one of the most expansible of metals, and that a column of this fluid, for instance, that is exactly thirty inches long at the temperature of 80° will not be exactly thirty inches long at any other temperature, say that of zero. Its absolute weight will be just as much at the one temperature as at the other; and, therefore, the atmospheric pressure remaining the same, it is easily understood how the height of the barometer will change with every change of temperature.

Since, then, the temperature of the trade-winds is higher than that of the gales off Cape Horn, the barometer in the *open air* ought to show a greater apparent pressure—*i. e.*, a higher column—in the former than in the latter region. This difference would amount, on the average, only to the expansion of the mercurial column due the change of temperature. This difference of column would probably not amount to as much as 0.2 inch (two-tenths of an inch), if the Cape Horn barometer were kept in the open air; but generally it is not so kept. It probably does not amount, in reality, to more than 0.05 inch, if so much; for the usual place for the barometer is the captain's cabin, and there the temperature to which it is subjected is probably not more than a few degrees, at most, below that of the trade-winds. The stove in the cabin, the heat of the crew below, all tend to lessen, in the cabin, the difference of temperature between winter and summer.

Nevertheless, if navigators would always require a thermometer to be attached to the barometer (or would not purchase a barometer without an attached thermometer), and would note it also whenever the barometer is recorded, the correction for temperature, be it much or little, might be applied. This correction cannot be applied here, because navigators are not in the habit of observing the attached thermometer.

Now, here is a most important and interesting physical phenomenon, which cannot be properly or thoroughly investigated for the want of a marine barometer capable of giving correct absolute determinations. Nay, we are embarrassed and crippled in the investigation for the want of the readings of the attached thermometer. If we had these, we could show, from the observations we have, very nearly the exact difference between the mean height of the barometer in the trade-winds and off Cape Horn.

I mention this to illustrate the importance of a nicer and more accurate system of observations, as recommended by the Brussels Conference.*

Let us return to the tables.

Now, as the barometers in these tables, which show the pressure in the trade-winds, are the identical barometers which show the pressure off Cape Horn also—they require no correction, save that of temperature, to show the difference between the absolute barometric pressure in the trade-winds, and off Cape Horn. If the barometer have an error of 0.2 in., or an error of any other value too much or too little in the trade-winds, it carries precisely the same error off Cape Horn. These tables, therefore, though they do not show truly—because of the undetected errors of the common-marine barometer—the real pressure of the atmosphere, either in the trade-winds or off Cape Horn, yet they do show correctly, or very nearly so, the *difference* of pressure in those regions.

The difference is truly remarkable, and is well worthy of farther investigation.

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* Good, accurate, and standard marine barometers are now furnished by James Green, of New York, upon a plan devised by myself. The price is $38. P. Adie, 395 Strand, London, also manufactures a standard marine barometer, after a pattern approved by the British Association for the advancement of Science. The price of these is £3 5*s* 6*d*. I have ordered a large number of these for the navy.—M.

Barometric Anomalies off Cape Horn and in the Trade-Winds.

NAME OF VESSEL.	N. E. TRADES.						CAPE HORN.			S. E. TRADES.					
	ATLANTIC.			PACIFIC.						ATLANTIC.			PACIFIC.		
	Month.*	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days
JANUARY.															
Emily Miner	I–II.	30.07	5	VII.	29.95	5	IV.	†a 29.20	4	II.	29.83	5	VI.	30.02	5
Amelia	I–II.	29.80	4	V.	29.72	4	III.	29.36	5	II.	29.86	4	IV.	29.72	4
Rattler	I.	29.65	5	IV–V.	29.94	4	III.	28.80	5	II.	29.84	4	IV.	29.88	6
Tornado	I.	29.95	5	V.	29.92	4	III.	28.87	4	II.	29.86	4	IV.	29.85	4
John Stuart	I.	29.91	4	V.	30.05	5	II.	29.65	5	I.	29.84	4	IV.	29.88	4
Celestial	I.	29.66	4	V.	29 81	4	III.	29.00	4	II.	29.65	4	V.	29.80	4
Phantom	I.	29.95	4	V.	29.92	5	II–III.	29.56	5	II.	29.90	5	V.	29.80	4
Aldebaran	I.	30.13	5	V.	30.26	5	III.	29.89	6	II.	30.00	5	IV.	30.10	4
Lucknow	I.	30.00	4	V.	29.94	5	III.	29.21	3	II.	29.87	5	V.	29.90	4
Astrea	I.	29.68	5	VI.	29.80	5	IV.	28.97	4	II.	29.52	5	V.	29.64	5
Hurricane	I.	30.04	4	III.	29.99	5	II.	29.29	4	I.	30.02	4	III.	30.04	5
Means		29.90	49		29.94	51		29.26	49		29.84	49		29.93	49
FEBRUARY.															
Burlington	II.	30.02	4	VI.	30.16	6	IV.	29.10	4	II.	30.00	6	V.	30.02	5
Francisco	II.	30.00	4	VII.	30.30	4	IV.	‡a 30.00	5	II.	29.97	4	V.	30.10	3
Kate Hays	II.	30.04	4	VI.	30 05	4	IV.	‡b 28.68	5	III.	30.05	4	V.	30.16	6
Susquehanna	II.	30.16	5	V.	30.00	5	III.	29.26	4	II.	30.06	5	IV.	30.06	5
Stag Hound	II.	30.15	4	V.	29.92	5	III.	29.07	4	II.	29.92	4	IV.	30.10	5
Tagus	II–III.	30.02	5	VII.	30.32	5	IV.	‡c 29.82	4	III.	30.13	5	VI.	30.34	5
Helen McGaw	II.	30.28	4	VII.	30.04	4	V.	29.04	4	III.	30.12	4	VI.	30.15	4
Delia Maria	II.	30.02	5	VI.	30.20	5	IV.	29.50	4	III.	30.07	5	V.	30.17	4
Venice	II.	30.08	5	VII.	30.00	5	V.	‡d 28.68	5	III.	29.98	4	VI–VII.	29.99	4
Diadem	II.	29.82	5	VI.	30.06	5	III.	‡e 28.66	5	II.	29.80	5	V.	29.95	5
A. Cheseborough	II.	29.78	5	V.	29.76	5	III.	28.92	4	II.	29.82	4	IV.	29.77	5
Simoom	II.	29.68	5	V.	29.74	4	IV.	28.56	4	II.	29.50	5	IV.	29.79	4
Star of the Union	II.	29.85	4	V.	29.98	5	IV.	29.08	4	III.	29.84	4	IV–V.	29.88	4
Golden Rover	II.	30.10	5	V.	30.05	4	IV.	29.19	4	III.	30.17	4	V.	30.10	4
Means		30.00	64		30.04	66		29.13	60		29.96	63		30.04	63
MARCH.															
Flying Eagle	III.	30.10	4	VII.	29.90	5	V.	§a 29.47	6	IV.	30.00	4	VII.	30.05	6
Ariana	III.	29.92	5	VII.	29.97	5	V.	29.30	6	III.	29.82	5	VI.	29.94	5
Surprise	III.	29.93	4	VI.	30.09	4	V.	28.73	4	IV.	29.88	4	VI.	29.89	4
Swordfish	III.	29.72	4	V.	29.83	4	IV.	28.46	4	III.	29.73	4	V.	29.61	5
Houqua	III.	30.09	5	VII.	30.00	4	IV.	29.74	4	III.	29.96	4	VI.	30.01	5
Gov. Morton	III.	29.59	4	V.	29.70	4	IV.	29.22	4	IV.	29.56	4	V.	29.72	5
Sirocco	III.	30.20	4	VI.	30.12	5	IV.	29.60	4	III.	30.17	4	V.	30.37	4
Sarah Boyd	III.	30.16	5	VIII.	30.12	5	V.	§b 28.73	5	IV.	30.00	5	VIII.	29.95	4
Sherwood	III.	30.06	5	VII.	30.00	4	V.	29.16	5	IV.	29.99	5	VI.	30.00	4
Tornado	III.	29.95	4	VI.	29.83	5	IV.	28.42	4	III.	29.78	4	VI.	29.85	5
Francis	III.	30.00	4	IX.	29.70	4	V.	29.06	4	III.	30.00	4	VIII.	29.70	5
Wallace	III.	30.00	5	VI.	29.95	4	IV–V.	§c 29.05	4	IV.	30.20	3	V.	30.16	5
Chenango	III.	30.00	5	VII.	29.95	6	V.	29.42	5	IV.	29.92	5	VI.	30.07	4
Stephen Lurman	III.	29.99	4	VII.	30.09	5	V.	29.74	5	IV.	29.91	5	VI.	30.05	5
Rose Standish	III.	29.90	4	VII.	30.00	6	V.	§d 29.02	5	IV.	29.90	4	VI.	30.00	6
Louisa Bliss	III.	29.85	5	VIII.	29.85	4	V.	29.56	5	III.	29.78	6	VI.	29.86	6
Stag Hound	III.	30.00	6	VI.	30.22	5	V.	29.32	4	IV.	30.02	4	V.	30.00	6
Sea Serpent	III.	29.95	4	VI.	29.99	4	V.	29.07	4	IV.	29.82	4	VI.	30.00	4
Means		29.97	81		29.96	83		29.18	82		29.91	78		29.96	88

* January being I., December XII. See p. 195.

† *a.* S. W. gales.

‡ Gales for the most part. *a.* W. to S. S. W. *b.* N. to S. round by W. *c.* S. to W. *d.* W. N. W. to S. W. by S. *e.* W. to W. S. W.

§ Gales for the most part. *a.* N. W. to S. W. gales. *b.* N. N. W. to S. W. *c.* W. S. W. to S. W. *d.* S. S. E. to W. S. W.

Barometric Anomalies off Cape Horn and in the Trade Winds—Continued.

NAME OF VESSEL.	N. E. TRADES.						CAPE HORN.			S. E. TRADES.					
	ATLANTIC.			PACIFIC.						ATLANTIC.			PACIFIC.		
	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days
APRIL.															
Thomas B. Wales	IV.	30.12	6	VII.	30.06	4	V.	29.81	5	IV.	30.05	6	VI.	30.06	5
Queen of the East	IV.	29.95	4	VIII.	29.42	5	VI–VII.	28.90	5	V.	29.68	4	VII.	29.82	5
" "	IV.	29.92	5	VIII.	29.42	5	VI.	29.40	4	V.	22.68	5	VII.	29.82	5
Harriet Hoxie	IV.	29.87	4	VII.	30.74	4	V.	29.18	4	IV.	29.72	4	VII.	29.75	3
White Squall	IV.	30.41	4	VII.	30.02	4	VI.	29.58	4	V.	30.52	5	VI.	30.12	4
Horsburgh	IV.	30.19	4	VII.	30.04	5	V.	29.46	4	IV.	30.01	5	VI.	30.09	4
Raduga	IV.	29.92	4	VIII.	30.10	5	VI.	30.04	6	V.	29.92	5	VII.	30.00	5
Lion	IV.	29.81	5	XII.	29.98	5	II.	29.05	4	III.	29 89	4	I.	29.96	5
R. C. Winthrop	IV.	30.10	4	VII.	30.08	5	VI.	29.22	5	V.	30.38	5	VII.	30.08	5
Competitor	IV.	29.83	4	VII.	30.00	6	V.	29.43	3	IV.	29.92	5	VI.	30.00	4
Empress of the Seas	IV.	29.90	4	VI.	30.10	5	V.	29.50	4	IV.	29.89	5	VI.	29.96	5
Parthian	IV.	29.64	5	VII.	29.82	5	V.	29.05	4	IV.	29.65	4	VI.	30.10	6
Means		29.98	53		29.93	58		29.35	52		29.94	57		29.98	56
MAY.															
Fenelon	V.	29.90	5	XI.	30.02	4	VIII.	29.60	4	VI.	29.92	5	X.	30.37	4
N. B. Palmer	V.	30.02	5	VIII.	30.16	6	VII.	28.84	5	VI.	29.88	6	VII.	30.15	4
Staffordshire	V.	29.86	6	VIII.	29.96	5	VII.	*a 28.82	4	VI.	29.95	4	VI.	30.10	4
Tartar	V.	29.84	4	VIII.	29.90	5	VI.	29.08	5	V.	29.84	4	VII.	29.89	7
Means		29.90	20		30.01	20		29.08	18		29.90	19		30.13	19
JUNE.															
Witch of the Wave	VI.	30.16	4	VIII.	30.10	3	VII.	29.55	4	VI.	30.00	4	VIII.	30.09	5
Carioca	VI.	30.01	5	IX.	29.85	4	VIII.	28.98	4	VI.	29.96	4	VIII.	29.65	5
F. Copeland & Co.	VI.	30.30	5	IX.	30.17	4	VIII.	29.50	5	VI.	30.25	4	IX.	30.14	5
Union	VI.	30.20	4	IX.	29.87	5	VIII.	†a 28.50	4	VI.	29.73	4	VIII.	29.95	4
Messenger	VI.	30.00	4	IX.	29.96	5	VII.	29.28	4	VI.	30.02	5	VIII.	30.03	5
Samoset	VI.	30.42	4	IX.	30.10	4	VIII.	29.70	4	VII.	30.24	5	IX.	30.26	5
Means		30.18	26		30.01	25		29.25	25		30.03	26		30.00	29
JULY.															
Defiance	VII.	29.82	5	XI.	30.05	4	IX.	29.06	4	VIII.	30.00	4	X.	29.88	6
Matilda	VII.	30.51	4	XII.	30.47	6	X.	‡a 29.82	9	VIII.	30.52	5	XI.	30.50	6
Raduga	VII.	29.58	5	XII.	29.80	5	X.	‡b 29.38	4	VIII.	29.58	5	X.	30.00	4
Means		29.97	14		30.11	15		29.42	17		30.03	14		29.96	16
AUGUST.															
Raven	VIII.	29.80	4	XI.	29.90	5	IX.	29.60	4	IX.	29.95	4	X.	30.06	5
Fancy	VIII–IX	30.00	4	II.	30.20	5	XI.	§a 28.72	5	IX.	30.00	5	I.	30.10	5
Wessacumcon	VIII.	30.05	5	I.	29.93	5	X.	28.78	6	IX.	30.07	5	I.	30.03	5
Means		29.95	13		30.01	15		29.06	15		30.01	14		30.06	15

* Gales for the most part. *a.* S. to W.

† Gales for the most part. *a.* N. W. to W. S. W.

‡ Gales for the most part. *a.* W. N. W. to W. S. W. *b.* S. W. to W.

§ Gales for the most part. *a.* S. S. W. to N. W. round by W.

Barometric Anomalies off Cape Horn and in the Trade Winds—Continued.

NAME OF VESSEL.	N. E. TRADES.						CAPE HORN.			S. E. TRADES.					
	ATLANTIC.			PACIFIC.						ATLANTIC.			PACIFIC.		
	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days	Month.	Bar.	No. of days
SEPTEMBER.															
Delegate	IX.	30.07	3	I.	30.02	5	XI.	*a 29.11	5	X.	30.08	5	I.	30.02	6
Chas. Mallory	IX.	29.80	3	XII.	29.88	4	XI.	28.73	4	X.	29.87	4	XII.	29.97	4
Malay	IX.	30.14	4	XII.	30.19	6	XI.	29.05	4	X.	30.16	4	XII.	30.17	4
Robt. Pulsford	IX.	29.91	4	I.	29.90	3	XI.	28.87	5	X.	29.90	5	XII.	30.00	5
U. S. S. Vandalia	IX.	30.12	4	III.	29.98	5	XII.	29.27	4	X.	30.08	4	II.	29.89	4
Means		30.01	18		29.99	23		29.01	22		30.02	22		30.01	23
OCTOBER.															
Comet	X.	29.99	3	II.	29.96	4	XI.	29.45	5	XI.	29.90	3	I.	29.90	4
Golden City	X.	29.78	3	XII.	29.67	5	XI.	†b 28.53	4	X.	29.70	6	XII.	29.81	4
Wild Pigeon	X.	30.17	4	I.	30.30	5	XII.	†a 29.05	4	IX.	30.17	4	I.	30.25	6
Ambassador	X.	29.88	4	I.	30.00	5	XII.	29.17	5	X.	29.91	5	I.	29.95	4
Acasta	X.	30.00	5	III.	30.00	5	I.	29.03	6	XI.	30.00	4	III.	30.00	4
Comet	X.	30.17	4	I.	30.16	5	XI.	29 34	4	X.	30.05	5	XII.	30.07	5
Genesee	X.	30.03	3	III.	30.25	5	I.	29.75	4	XI.	29.96	4	II.	30.23	5
Tornado	X.	29.77	3	VIII.	29.81	4	IX.	29.49	4	X.	29.77	4	VIII.	29.86	4
Senator	X.	29.97	5	I.	29.95	4	XI.	29.40	4	X.	29.95	4	XII.	30.20	4
Realm	X.	29.76	4	II.	29.65	5	XII.	29.33	4	XI.	29.65	4	I.	29.85	4
Means		29.95	38		29.97	47		29.25	44		29.91	43		30.01	44
NOVEMBER.															
Flying-Fish	XI.	29.99	5	I.	29.80	4	XII.	29.52	4	XI.	30.00	3	I.	30.12	4
Wild Pigeon	XI.	30.15	5	I.	30.02	4	XII.	‡a 28.71	5	XI.	30.00	5	I.	30.21	5
Trade-Wind	XI.	29.93	4	II.	30.01	6	I.	29.35	4	XII.	29.88	4	II.	29.95	4
Hazard	XI.	29.89	4	II.	29.90	3	I.	29.39	5	XII.	29.90	4	II.	29.90	5
Newton	XI.	29.87	4	III.	29.91	5	I.	29.43	5	XII.	29.93	5	II.	29.95	5
Flying Dutchman	XI.	30.00	5	I.	29.93	5	XII.	29.07	5	XI.	30.01	5	I.	29.99	3
R. C. Winthrop	XI.	29.65	4	III.	29.54	4	I.	29.35	5	XII.	29.63	5	II.	29.53	4
Sword Fish	XI.	29.80	4	I.	29.96	5	XII.	28.95	4	XII.	29.75	4	I.	30.09	4
Imaum	XI.	30.04	5	III.	30.07	4	I.	‡b 29.08	5	XI.	29.96	5	II.	30.00	5
Means		29.92	40		29.91	40		29.10	42		29.90	40		29.97	39
DECEMBER.															
Europe	XII.	29.96	9	III–IV.	29.93	19	II.	28.92	14	XII–I.	29.87	6	III.	29.85	11
George Brown	XII.	29.93	4	III.	29.80	5	II.	29.34	5	XII.	29.80	4	III.	29.83	5
Lucia Field	XII.	29.74	5	III.	29.71	5	I.	29.43	5	XII.	29.74	5	III.	29.75	5
Southerner	XII.	29.88	4	IV.	29.84	5	II.	§a 29.32	4	I.	29.95	5	III.	29.93	6
Uriel	XII.	29.84	5	IV.	29.70	6	II.	§d 29.10	5	XII.	29.84	5	III.	29.80	9
Elsinore	XII.	30.28	4	V.	30.30	5	III.	29.42	4	I.	30.05	4	IV.	30.21	4
Tingqua	XII.	29.97	2	II.	30.00	4	I.	29.24	5	XII.	29.92	4	II.	29.95	4
Gray Feather	XII.	29.89	5	II.	29.98	5	I.	29.27	4	XII.	29.91	4	II.	29.90	4
Golden Gate	XII.	30.12	5	III.	30.00	5	I.	29.38	5	XII.	30.00	5	II.	30.06	5
Telegraph	XII.	29.85	4	II.	29.98	5	I.	§e 28.96	5	XII.	29.95	5	II.	30.83	5
Seaman	XII.	30.12	6	II.	30.17	5	I.	§b 29.57	4	XII.	30.09	5	II.	30.25	5
Surprise	XII.	29.94	4	III.	30.06	5	I–II.	§c 29.55	4	I.	29.95	5	II.	29.96	5
Means		29.96	57		29.96	74		29.29	64		29.91	57		30.02	68
Means of all		29.97			29.99			29.20			29.95			30.01	
Whole No. of days			473			517			490			482			509

* Gales for the most part. *a.* W. N. W. to W. S. W.   † Gales for the most part. *a.* W. to S. W. *b.* S. W.

‡ Gales for the most part. *a.* N. to S. S. W. round by W. *b.* W. N. W. to W. S. W.

§ Gales for the most part. *a.* W. to W. S. W. *b* W. by S. to W. by N. *c.* S. W. to S. *d.* W. to S. W. *e.* S. W. to W. N. W.

Mean Monthly Height of the Barometer—

MONTH.	IN N. E. TRADES OF THE				OFF CAPE HORN.		IN S. E. TRADES OF THE			
	ATLANTIC.		PACIFIC.				ATLANTIC.		PACIFIC.	
	Bar.	Days of observation.	Bar.	Days of observation.	Bar.	Days of observation.	Bar.	Days of observation.	Bar.	Days of observation.
January	29.90	49	30.00	50	29.34	64	29.96	22	30.04	55
February . . .	30.00	64	29.98	42	29.24	43	29.88	74	30.03	60
March	29.97	81	29.95	53	29.17	53	29.97	65	29.90	45
April	29.98	53	29.85	34	29.17	66	29.91	76	29.93	49
May	29.90	20	29.93	73	29.24	91	30.00	28	29.97	69
June	30.18	26	30.05	57	29.37	29	29.96	36	30.03	98
July	29.97	14	30.07	91	29.12	17	30.24	5	29.94	40
August	29.95	13	29.84	47	29.26	21	30.03	14	29.88	32
September . . .	30.01	18	29.94	26	29.38	12	30.01	14	30.20	10
October	29.95	38			29.33	19	29.95	46	30.08	19
November . . .	29.92	40	29.99	13	29.02	40	29.99	37	30.50	6
December . . .	29.96	57	30.00	31	29.13	35	29.88	65	30.04	26
Means . . .	29.97	473	29.96	517	29.23	490	29.98	482	30.05	509

One of the aims kept constantly in view during the preparation of these tables, was to follow the same ship with its barometer through the trade-winds of the Atlantic, around Cape Horn, and thence through the trade-winds of the Pacific, so that the barometric differences off Cape Horn might be true.

If, therefore, the vessel passed through the N. E. trades of the Atlantic in January, for instance, it would be some months after before she would arrive with the same barometer in the N. E. trade-wind region of the Pacific. Hence, the barometers are arranged by the months, in their order only, for the N. E. trades of the Atlantic. The months for the other regions are denoted by Roman numerals—XII. for December, I. for January; and so on in order of the months.

The low state of the barometer in the trade-winds of the Atlantic, and especially in the N. E. trade-winds, will not escape attention. The S. E. trade-winds of the Pacific give the highest barometer.

In the Atlantic, both systems of trade-winds, but the northern the most, are interfered with by the continent of Africa with its heated plains. These plains turn those winds back from their regular course, and therefore tend to lessen the pressure.*

* While the proof of this signature is in hand, I receive a letter from Prof. Kämtz, the celebrated meteorologist, from which the following is extracted:—

"I have read your work with very great satisfaction and pleasure; but I must add, that it is one of those rare books that cannot be read; it must be attentively studied. So great is the number of important facts communicated in it, that great attention is necessary for not to overlook some observations that are made use of in the subsequent theoretical investigations. Some remarks you have made on the westerly winds at the western coast of Africa, on the high temperature of the Indian Sea, have confirmed the conjectures I had more than twenty-five years ago, when I composed my treatise on meteorology. Romme, Dampier, and others, said that there were here always the trade-winds; but, on the other hand, some observations made by Cook on his first voyage, and the opposition between the heat of the Atlantic and the great desert of Africa, indicated that there were here westerly winds; but having myself confined in that work to give the result of observations and not to accumulate new meteorological hypotheses to the great number of those existing at that time, I said nothing on my conjecture of westerly winds in this region. You are the first who has proved that my hypothesis was a right one. I have this not written for to diminish your merit; on the contrary, with pleasure I acknowledge your priority."—*From a Letter of Prof. Kämtz to Lieut. Maury, dated Dorpat, 17th February*, 1855.

I know not how better to illustrate this than by referring to a canal which has a gentle current, and the water of which we will liken to the flow of the trade-winds.

Now, suppose that, up stream from the observer, some agent, a pump, for example, be set to work upon the canal, and that it be pumping up vast quantities of water from the canal, as those heated plains of Africa pump up volumes of air from the trade-winds—for that those plains do cause vast columns of atmosphere to ascend there is no doubt, which ascending columns are, to a great extent, drawn from the trade-wind region—what would be the effect? The level of the water in the canal would be changed; *its* barometric pressure would be diminished as it commenced to flow back, very much in the same way that the barometric pressure of the trade-winds is diminished when they are turned back, and become monsoons.

The same sort of agent from the plains of Texas, New Mexico, &c., is at work upon the N. E. trade-winds of the Pacific, producing there the monsoons of Central America.

Now there is no heated plain in the rear of the S. E. trades of the Western Pacific, no *vis à tergo* there which is capable of converting those winds into a monsoon, or of changing their direction. Hence the normal barometrical *status* there—its excess in comparison with that of other trade-winds.

We may explain this in another way; but it amounts to the same thing whether we say the effect is produced in the manner just explained, or whether we say it is produced by the greater amount of atmospherical rarefaction caused by the great extent of heating surface on the land in the northern hemisphere in comparison with that in the southern.

But the Cape Horn anomaly—the difference of nearly an inch (0.8 inch), in the mean height of the barometer off Cape Horn and in the trade-winds—how is that to be accounted for?

The chapter on the "Barometric Anomalies of the Andes," p. 240, fifth edition of this work, treats of the converse of this anomaly, but alludes to the probability of an average low barometer on the western side of those mountains.

After much reflection, no new and complete explanation of this phenomenon suggests itself. The explanation which was proposed by me in *Silliman's Journal*, 1834, seems, after a most careful review, to be the most plausible of any that I am prepared to suggest.

From about 45° S. to the parallel of Cape Horn, lies the belt in which the westerly winds of the southern hemisphere prevail with such trade-wind like regularity.

The Southern Andes stretch themselves perpendicularly across this belt. They obstruct these winds and cause a piling up of the atmosphere, not unlike the piling up of the water which is produced by a sunken rock in a strong tide way.

I take Pot Rock, in Hurlgate, as an illustration, and because most American navigators will recollect it. Pot Rock was some feet below the surface, 8 or 10, yet such was the effect produced by it, in arresting the waters which the powerful tides caused to sweep over it, that there was always to be seen, when the tide was at its strength, an elevation or piling up of the water above—up stream from—the rock. It was a sort of recast or mould of the rock in the water.

The greatest elevation in the water was not immediately over the rock, but it was a little up stream,

i. e., to windward of it. Nor was the greatest depression in the water immediately over the rock; it was a little down stream, that is, to leeward of it.

There was also another depression not so great as this, it is true, but it was a depression; it was above, or up stream from, the piling up.

Similar elevations and depressions, but on a scale much more grand, are, I suppose, created by the Andes, in the air, by reason of the obstructions afforded by these mountains to the great atmospherical currents.

In considering the courses which combine to make this low barometric pressure off Cape Horn, the effect, however small, which is due increase of attraction on one hand, and a diminution of superincumbent atmosphere on the other, should not be forgotten.

Owing to the figure of the earth, the flattening in at the poles, the navigator, with his barometer, is several miles nearer to the centre of attraction when he is off Cape Horn, than he is when at the equator. Being nearer to the centre, the force of attraction is greater; and if it were possible to weigh the mercury in the tube of his barometer at the two places, he would find that 290 ounces, for instance, at the equator, would weigh 291 at Cape Horn; in other words, that his mercury is heavier off Cape Horn than at the equator; here, then, is one of the causes, though it be a slight one, which may assist in keeping the barometer down, off Cape Horn.

Another one arises from the decrease in the volume of superincumbent atmosphere, on account of those agents which make the earth flat at the poles.

Suppose, for instance, that we were removed from the earth, and that, instead of seeing its shape, according to the outlines which the land and water present, we could see its shape with its aerial covering on; we should find that the difference between the equatorial and polar diameters of this covering would be greater than the difference between the equatorial and polar diameters of the earth, as measured from the sea level.

But these two causes—increase of attraction and oblateness—do not appear practically to affect, by any considerable quantity, the mean height of the barometer in corresponding latitudes north; for instance, at St. Petersburg, in latitude 59° 56′ N., the mean height of the barometer, reduced to the temperature of 62°, is 29.97.

Upon a review of the whole subject, therefore, and without going into the question as to the precise effects due temperature, and the figure of the earth, we are still left to infer that the barometric anomalies about Cape Horn are owing, to a considerable extent, at least, to the effect of local agencies and causes.

I hope navigators will not let this subject rest; that they will continue to direct their attention to it, and to let me have the benefit of farther and careful observations touching the indications of the barometer off Cape Horn. That they may the better be able to do this, they should bear in mind that the barometric pressure off Cape Horn at 29, is as common as the barometric pressure elsewhere, of 30; and that when they see the barometer off Cape Horn sink down to 28, it is no more significant of a gale than a barometer

at 29 is in the North Atlantic. Perhaps, if South Sea navigators will bear this fact in mind, and count the changes above and below 29, instead of 30, this instrument may redeem its lost character off Cape Horn.

U. S. Ship St. Mary's,

Valparaiso, *January* 20, 1854.

Sir: You will receive by this steamer's mail an abstract of the run of this ship from St. Catherine's (Brazil) to this port, prepared and forwarded by the very intelligent Lieutenant, Mr. Frailey.

My object in writing is to call your attention to the barometrical indications south of Staten Land and Terra del Fuego; and to the regularity and certainty with which the mercury falls with a northerly wind and rises with a southerly. At this season—the summer—an easterly wind is rare, and, if it occurs, is of short duration. We found none. The north or northwest winds are usually accompanied by cloudy, rainy, or misty weather; soon after it sets in, the mercury begins to fall, and continues to sink as long as the wind has northing in it, when there is usually an interval of calm, or light variable winds, lasting two or three hours; after which, it veers to the southward or southwestward, squally, precipitating the mists in the form of hail and sleet, and exposing (at the S. W.) clouds of the cumulus character. At this point the mercury begins to rise, and continues ascending as long as the wind has southing in it. A low barometer (say 28.50) will thus react with a southerly wind, and a high barometer (say 29.90) with a northerly. I inclose a copy of our barometrical tables for the purpose of clearly illustrating the law, and to which, with the excellent summary of Mr. Frailey, I direct your attention. It will be seen that, on the 10th of January, 1854, at about 4 A. M., latitude 57° 40′ S., longitude 79° 10′ W., wind northward and westward, we were standing on the starboard tack—all sail set—making our westing. The barometer had gradually fallen with the wind to 28.48, when the wind became light and hauled to the southward. After wearing ship, we had scarcely trimmed on the port tack when the wind freshened so suddenly that we were obliged to bear up to secure our sails. To reef was out of the question. Fortunately, we had made enough westing to run the ship clear of the land. With the foretopmast and fore storm staysails, and double reefed fore trysail set, fifteen knots were reported—afterwards fourteen. The barometer commenced rising soon after the gale set in, and, in about thirty-two hours, had reached 29.84; and, when the wind again veered to the northwest, commenced falling.

This has been my experience, after three passages around Cape Horn, in which my attention has been directed to this phenomenon. And so fully convinced am I of the truth of my experience, that I would advise ships (after passing the Straits of Le Maire, which is free from all danger, saving thereby, at least one degree of westing) having a northerly wind and a falling barometer, to stand on a wind to the southward, confident of the wind's direction, so long as the mercury tends to fall. If it reaches a minimum somewhat below 29 inches, and a calm ensues, equally to be certain of a "southwester," and to be in a position if possible to profit by it.

I state these facts to you, for the purpose of eliciting from you a speculation as to the cause of this

conduct in the barometer. As well as I can ascertain, navigators but casually mention the fact that gales come on with a rising barometer, and do not allude to the regularity with which gales from the north and south move the mercury up and down. If you consult data which may be in your possession, relative to this fact, I think you will find my observations verified. At the same time that I solicit your attention to the demonstration of the cause of the phenomenon alluded to, I beg leave to suggest the following inquiries, believing them to have some near or ultimate relationship to the questions that I propound:—

1. Is not the northerly column of atmosphere lighter than the air it displaces at the south in consequence of the combined effects of the caloric it bears with it, and the greater centrifugal force of its particles, having performed a longer segment of rotation; thereby permitting the column of mercury to fall?

2. May not the converse be true with regard to the greater density of a southern column of atmosphere, coming from points of comparatively less centrifugal tendency and markedly colder; thereby elevating the column of mercury?

3. May not the probable existence of an atmospheric tidal wave, in addition to the known laws of atmospheric pressure, affect the behavior of the barometer, forming local causes which may modify its indications, and serve to explain any apparent discrepancy from the observed general law?

I submit my facts, my questions, and my suggestions with a wish to contribute my mite to the department of science to which you have so successfully directed your attention. If you will be so kind as to favor me with your views and speculations that may bear particularly on the question of the cause of these regular and constant changes in the barometer, you will oblige me by addressing your communication to the care of the U. S. consul, Panama.

I am, respectfully,
Your obedient servant,
T. BAILEY,
Commander.

To LIEUT. M. F. MAURY,
Superintendent of National Observatory,
Washington, D. C.

December 31, 1853. Lat. 52° 53′ S. Long. 64° 50½′ W. At noon.			January 1, 1854. Lat. 54° 42½′ S. Long. 64° 41′ W. At noon.			January 2, 1854. Lat. 67°* 15′ S. Long. 66° 17′ W.			January 3, 1854. Lat. 57° 26′ S. Long. 66° 26′ W. At noon.		
Hour.	Bar.	Wind.	Hour.	Bar.	Wind.	Hour.	Bar.	Wind.	Hour.	Bar.	Wind.
1			1	28.90	N. N. W.	1	29.00	East	1	29.09	S. W. by W.
2			2	28.88	"	2	28.97	N'd and E'd	2	29.11	"
3			3	28.86	N. W.	3	28.96	W. by N.	3	29.12	"
4			4	28.85	"	4	28.94	West	4	29.12	"
5			5	28.85	Westward	5	28.96	N. N. W.	5	29.15	W. by S.
6			6	28.87	W. S. W.	6	28.96	W. by N.	6	29.16	S. W. by W.
7			7	28.87	"	7	28.96	W ½ N.	7	29.19	S. W. ½ W.
8			8	28.90	W. by N.	8	28.96	"	8	29.18	S. W. by W.
9			9	28.93	"	9	28.96	W. S. W.	9	29.19	Variable
10			10	28.94	Variable	10	28.96	W. by S.	10	29.20	"
11			11	28.96	S. S. E.	11	28.96	"	11	29.22	N. N. W.
12	29.15	West	12	28.97	"	12	28.96	"	12	29.23	"
1	29.14	"	1	28.97	Calm	1		Variable	1	29.22	"
2	28.13	"	2	28.97	Variable	2		"	2	29.22	E. N. E.
3	29.12	"	3	28.97	North	3	29.00	W. by N.	3	29.23	Calm
4	29.12	"	4	28.95	N. N. E.	4	29.00	"	4	29.25	Variable
5	29.11	N. by W.	5	28.96	N. W.	5	29.02	West	5	29.27	S. W.
6	29.09	"	6	28.97	N. N. W.	6	29.06	"	6	29.27	"
7	29.07	"	7	28.96	Variable	7	29.06	"	7	29.33	S. W. ½ W.
8	29.07	"	8	28.86	S. E.	8	29.08	"	8	29.34	S. W. by W.
9	29.01	"	9	29.01	Variable	9	29.09	"	9	29.38	S. W.
10	28.99	Variable	10	29.01	"	10	29.08	"	10	29.40	Southward
11	28.97	"	11	29.01	"	11	29.08	"	11	29.44	S. W. by S.
12	28.94	N. N. W.	12	28.99	"	12	29.08	W. S. W.	12	29.44	S. S. W.

January 4, 1854. Lat. 57° 11′ S. Long. 68° 02′ W. At noon.			January 5, 1854. Lat. 58° 20′ S. Long. 72° 03′ W. At noon.			January 6, 1854. Lat. 57° 38′ S. Long. 72° 50′ W. At noon.			January 7, 1854. Lat. 56° 49′ S. Long. 73° 03′ W.		
Hour.	Bar.	Wind.	Hour.	Bar.	Wind.	Hour.	Bar.	Wind.	Hour.	Bar.	Wind.
1	29.46	S. W. by S.	1	29.28	W. by N.	1	29.16	W.S.W. ½ W.	1		S'd and W'd
2	29.50	"	2	29.25	"	2	29.16	W. by S.	2		"
3	29.51	S. S. W.	3	29.24	"	3	29.15	"	3		"
4	29.53	"	4	29.24	W. N. W.	4	29.15	"	4	29.12	"
5	29.51	S. W. by W.	5	29.24	"	5	29.11	Westerly	5	29.20	S. W. by S.
6	29.52	"	6	29.20	"	6	29.09	"	6	29.21	"
7	29.52	"	7	29.16	N'd and W'd	7	29.08	W. S. W.	7	29.21	S. S. W. ½ W.
8	29.52	W. S. W.	8	29.10	"	8	29.04	"	8	29.21	S. S. W.
9	29.52	"	9	29.09	N. W. ½ W.	9	29.05	"	9	29.22	S. W. by S.
10	29.53	S.W. by W. ½ W.	10	29.04	"	10	29.05	"	10	29.22	"
11	29.54	W. S. W.	11	29.03	N. W. by W.	11	29.06	S. W. by S.	11	29.20	"
12	29.54	W. ½ S.	12	29.02	W. N. W.	12	29.07	"	12	29.21	"
1	29.50	"	1	29.01	W. N. W.	1	29.07	"	1	29.28	"
2	29.53	Westward	2	28.97	W.N.W. ½ W.	2	29.07	"	2	29.28	"
3	29.50	W. by N.	3	28.99	West	3	29.10	S. S. W.	3	29.29	"
4	29.50	"	4	29.00	W. S. W. / S. S. W.	4	29.11	"	4	29.16	"
5	29.44	"	5	29.05	"	5	29.16	"	5	29.15	"
6	29.41	W. N. W.	6	29.07	South	6	29.17	"	6	29.15	"
7	29.38	"	7	29.06	"	7	29.20	"	7	29.17	W. S. W.
8	29.35	W. N. W. ½ W.	8	29.10	"	8	29.22	"	8	29.17	W.S.W. ½ W.
9	29.30	W. ½ N.	9	29.19	"	9	29.22	"	9	29.17	"
10	29.27	W. by N.	10	29.14	N. N. W.	10	29.23	"	10	29.17	S. W.
11	29.27	"	11	29.13	"	11	29.24	"	11	29.18	S. S. W.
12	29.27	"	12	29.13	N. W. ½ W.	12	29.24	"	12	29.18	"

* Probably 57°.—M.

January 8, 1854. Lat. 56° 31′ S. Long. 73° 41′ W. At noon.			January 9, 1854. Lat. 57° 38′ S. Long. 76° 04′ W. At noon.			January 10, 1854. Lat. 56° 46′ S. Long. 80° 12′ W. At noon.			January 11, 1854. Lat. 54° 02′ S. Long. 80° 00′ W. At noon.		
Hour.	Bar.	Wind.*	Hour.	Bar.	Wind.*	Hour.	Bar.	Wind.*	Hour.	Bar.	Wind.*
1	29.20	S. W.	1	29.00	West	1	28.61	N. N. W.	1	29.40	S'd and E'd
2	29.20	"	2	28.99	"	2	28.57	N'd and W'd	2	29.42	"
3	29.20	"	3	28.98	"	3	28.53	Variable	3	29.42	"
4	29.18	"	4	28.97	"	4	28.48	South	4	29.42	"
5		"	5	28.96	"	5	Heavy gale. Log slate rubbed out	"	5	29.60	S. S. W.
6		"	6	28.94	W. by N.	6		"	6	29.62	"
7		"	7	28.93	W. N. W.	7		"	7	29.68	"
8	29.18	"	8	28.88	"	8	28.50	Southward	8	29.71	S. W. by S.
9	29.21	"	9		"	9	Severe gale. Log slate rubbed out	"	9	29.74	"
10	29.21	S. W. ½ W.	10	28.90	N'd and W'd	10		"	10	29.76	"
11	29.19	S. W.	11	28.89	"	11		"	11	29.80	S. W.
12	29.19	S. W. by W.	12	28.87	"	12		"	12	29.82	Westward
1	29.17	W. S. W.	1	28.80	W. N. W.	1	28.62	"	1	29.83	Variable
2	29.16	"	2	28.77	"	2	28.70	"	2	29.84	W. N. W.
3	29.17	W. by S.	3	28.75	"	3	28.90	"	3	29.84	N. W. by W.
4	29.16	W. ½ N.	4	28.71	"	4	28.91	"	4	29.78	"
5	29.11	"	5	28.69	N. W. by W.	5	29.11	"	5	29.76	N. W. ½ N.
6	29.10	"	6	28.68	W. N. W.	6	29.11	"	6	29.74	N. W.
7		"	7	28.66	N. W. by W.	7		"	7	29.74	N. W. ½ N.
8	29.08	"	8	28.63	W. N. W.	8	29.30	"	8	29.70	N. W.
9	29.04	N. W. by W.	9	28.64	N. W. ½ N.	9	29.30	"	9	29.70	N. W. ½ N.
10	29.04	N. W.	10	28.65	"	10	29.36	"	10	29.66	"
11	29.01	"	11	28.65	"	11	29.41	"	11	29.61	N. by W. ½ W.
12	29.01	W. ½ N.	12	28.65	"	12	29.44	"	12	29.60	N. by W.

January 12, 1854. Lat. 53° 18′ S. Long. 81° 15′ W. At noon.											
Hour.	Bar.	Wind.*	Hour.	Bar.	Wind.*	Hour.	Bar.	Wind.*	Hour.	Bar.	Wind.*
1	29.57	N. by W.	7	29.54	West	1	29.55	W. by N.	7	29.58	W. ½ S.
2	29.55	W. N. W.	8	29.54	"	2	29.56	"	8	29.58	"
3	29.54	W. by N.	9	29.53	W. by N.	3	29.56	West	9	29.63	W. S. W.
4	29.54	West	10	29.53	"	4	29.56	"	10	29.63	"
5	29.54	W. by N.	11	29.54	"	5	29.58	"	11	29.63	"
6	29.54	W. ½ N.	12	29.54	"	6	29.57	W. by S.	12	29.63	"

The discussion of unexplained physical phenomena, such as those of the barometer, is always profitable, for it serves to direct the attention of observant men to the subject, and to elicit both facts and thought. Bearing this in mind, and recollecting the character of the men who are collecting materials at sea for this work, I have made it a rule to invite, on every suitable occasion, opinions and suggestions as well as observations from them, and have always in return derived profit, and frequently instruction, by the reference.

Among the subjects so referred may be mentioned tide rips and colored patches of water at sea—pink, white, black, or red—as well as the anomalies in the pressure of the atmosphere. Tide rips were at first

* The direction of the wind is per compass.

to me very puzzling. They are commotions in the sea, resembling the motion of the water in a tide-way when the current is strong; and though they have all the appearance of a rapid translation of waters, navigators find that a vessel seldom or never feels their influence as currents. They are most frequently and regularly met with in the tropics and near the equatorial doldrums, that region of copious and almost ceaseless precipitation. Now these tide rips, I take it, are the gutters in the sea through which the rain that falls there is carried off and spread out again over the regions of evaporation. They, no doubt, are for the most part shallow currents of fresh or not very salt water, which nature employs to carry off the droppings of the equatorial cloud-ring, and the heaps of water which, as has been explained in another place, are piled up in this belt of calms by the N. E. trade-winds on one hand, the S. E. on the other. While these "rips," therefore, do not extend deep enough to set a ship out of her course; they would, I imagine, drift a small boat or lighter matter.

The fresh water of the Mississippi is often found standing in pools on the surface a hundred miles out to sea from the mouth of the river; and if fresh water may make basins for itself on the top of the salt, and thus stand in pools on the surface of the sea, why may it not also make a trough for itself, and run along as the Gulf Stream in channels more or less regular. This explanation is suggested by the remarks contained in an abstract log received here some time ago.

The Brussels Conference made special allusions to these curious patches of colored water which are sometimes found at sea, and which—especially the white and dirty red patches off the South American coast—frequently alarm navigators by causing them to suppose that they are in the midst of danger when no danger is near.

The following is a case in point:—

Ship Magnolia (Thomas Patterson), from Chinca Islands to Hampton Roads.

Nov. 30, 1854. Lat. 35° S.; long. 39° 15′ W. Barometer, 30; temperature of air, 66°; of water, 65°. Winds: N. N. E., calm, E. N. E. First part, light airs, from N. N. E.; middle, calm; latter, light, from N. N. E. Old song again. 30 miles per day. At daylight this morning we got into what appeared to be muddy water, extending for miles all around us; at the time, there was a school of whales blowing in every direction. In passing through this muddy water, as I supposed it to be, I caught a bucketful of it, and found it to contain millions of small marine animals intermixed with a glutinous substance. The bucket of water contained more than a pint, a small bottle of which I saved, and send you with this abstract. Had I been near the land, I should have been alarmed at it, as it appears very much like the water at the mouth of the Mississippi River.*

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* The following is received by this morning's mail:—

"George Manning, Esq., New York, will please forward this bottle to Lieut. Maury, Washington, and oblige Caleb Sprague.

The contents of this bottle was taken from the sea in latitude of 14° 33′ S., longitude 111° 05′ E., by Caleb Sprague, commander of ship Gravina, and is mentioned in my abstract log, sent to Lieut. Maury, as the water being of a milk color.

CALEB SPRAGUE,
Commander of Ship Gravina."

I have sent the bottle to my friend Prof. Bailey, of West Point.—M. March 20, 1855.

Ehrenberg and other microscopists have examined similar specimens of coloring matter from the Red Sea, the Yellow Sea, and other places; and it appears now to be generally conceded that these singular patches of colored water, found in various parts of the sea, and which are different from that water which derives its color from soundings on the bottom, derive their coloring matter, some from vegetable, some from animal organisms of various kinds.

The Brussels Conference asked for specimens of the water, from such patches, and I have accordingly received specimens from several shipmasters, all of which were sent to Prof. Bailey, of West Point, who had the kindness to undertake the examination of them. He found them, on opening the bottle, to emit an exceedingly offensive odor, arising from the putrid fragments of the animals which afforded the coloring matter to the sea. They were for the most part gelatinous; this was eminently the case with the specimens of the Magnolia, and those also of the Shooting Star, mentioned in another place.

It is good, but it is rare, to have for fellow laborers a corps of observers to whom one may appeal for light and always receive information; this has been eminently the case in these two instances. So too with the barometer off Cape Horn, and the barometric anomalies of the Andes. My corps of observers were too intelligent to let what was there said escape their attention, without observation; and during the last year, many contributions have been made to the general store of barometric observations off Cape Horn, and more attention has generally been given to the barometer at sea. No less than three observers, each independent of the other, and all evidently ignorant of what philosophers on shore had discovered, have, within the year, called my attention to the barometric tides of the torrid zone. With each, and as far as he was concerned, the discovery, I have no doubt, was original. I quote the letter and the observations of one of them.

San Francisco, *October* 14, 1854.

Sir: Herewith I send you some extracts from my abstract log which I think will interest you; they are *barometrical observations* taken during my voyage from Boston to this place. I am sorry they are not as complete as they ought to be; but I could not interest my officers sufficiently to induce them to make correct observations in the night; these I send are day observations mostly, and accurate; the few night observations there are, were made after I changed my officers, and I think are correct also.

I send them for the purpose of calling your attention to the *barometrical tides*, which I think they distinctly indicate in the low latitudes; in the high latitudes (in the observations which I have omitted here), they were not at all perceptible.

You will perceive that when in latitudes *low enough*, the barometer begins to *fall* at about eleven A. M. and continues falling until about *four* or *five* P. M., soon after which it commences to rise again, and attains its maximum height about eight or ten, while the few night observations taken since I noticed this phenomenon, seem to indicate *another* regular fall and rise during the night; you will notice, also, that all this occurs at about the same hours, whatever may be the latitude or longitude, and I believe whatever may be the age or position of the *moon*.

I am not aware that this phenomenon has ever been known or noticed before, except by Capt. Ranlett of the ship Surprise, and he did not seem to know that they were *permanent and universal.* I am therefore curious to know if the fact that they are so is new to all, or to me only; if the last, you will excuse my troubling you with this, for the sake of my good intentions.

I infer from your comments upon Capt. R.'s notice, that with such instruments as mine, little can be learned about them (the tides) except that *they exist;* I have therefore sent you such observations only as seem to prove that fact, in the hope that it will stimulate others to obtain for you more complete observations, made from instruments more correct than mine.

Mine is the common marine barometer with the thermometer attached to the *lid that covers the scale*, and, until the 13th of Sept., it hung in the skylight of the main cabin, where the sun could frequently reach the *thermometer*, while the cup of the barometer remained in the shade and in a much lower temperature. The *top* of the barometer hung 17 feet above the sea until the above date, when I removed it to my own cabin, where it hangs in the shade, in a more equal temperature and *two feet lower*, viz: 15 feet above the level of the sea, but the change did not affect the tides at all.

I *ordered* a complete set of instruments at Green's, in Broadway, to enable me to keep a man-of-war's abstract; but by a mistake, made too late to be rectified, I did not obtain them.

During the remainder of the voyage I shall observe with such instruments as I have, after which I shall take care to have those for which no apology will be needed.

I remain yours most respectfully,

FREDERICK CROCKER,

Master of Ship Mary Robinson, of New Bedford, Mass.

LIEUT. M. F. MAURY,

Washington, D. C.

P. S. I take this opportunity to express my thanks for the honor you did me in publishing my letter (from Whalemen) in the last edition of your Sailing Directions; had I supposed it possessed interest enough for that, I would have prepared it more carefully. I regret that you found it so difficult to ascertain my *whereabouts.*

Edward Mott Robinson, Esq., of New Bedford, generally knows where to find me. I hope to address you again some time about the barometer off Cape Horn, and about the currents in the Indian Ocean and China Sea.

*Barometer in the Tropics.**

DATE. 1854.	6 Bar.	Ther.	8 Bar.	Ther.	10 Bar.	Ther.	Noon. Bar.	Ther.	2 Bar.	Ther.	4 Bar.	Ther.	6 Bar.	Ther.	8 Bar.	Ther.	10 Bar.	Ther.	12 Bar.	Ther.	2 Bar.	Ther.	4 Bar.	Ther.	Noon. Latitude.	Noon. Longitude.
June 2	30.23		30.23		30.23		30.23		30.23		30.23	78	30.23	78	30.25	77									35°10′N.	55°00′E.
" 3	30.23	75	30.23	77	30.20	78	30.19	78	30.19	78	30.19	83	30.19	82	30.23	76									33 38	50 18
" 4	30.18	75	30.18	77	30.20	79	30.20	79	30.20	80	30.22	78	30.22	77	30.24	75									33 58	45 08
" 5	30.28	74	30.28	79	30.30	79	30.30	83	30.33	81	30.33	80	30.38	79	30.36	76									31 27	39 57
" 6	30.35	78	30.35	79	30.42	77	30.37	80	30.37	83	30.37	84	30.40	84	30.40	84									30 09	39 08
" 7	30.36	76	30.36	78	30.36	77	30.39	79	30.38	85	30.37	89	30.36	84	30.36	79									28 46	38 32
" 8	30.38	78	30.38	82	30.42	89	†																			
" 9	30.40	79	30.40	80	30.44	81	30.44	82	30.42	80	30.40	79	30.40	79	30.44	77									28 03	38 20
" 10	30.28	76	30.49	82	30.49	82	30.49	80	30.49	78	30.49	78	30.49	77	30.55	76									26 16	39 12
" 11	30.49	77	30.49	78	30.50	80	30.50	80	30.48	80	30.45	78	30.45	78	30.49	78									22 29	38 58
" 12	30.40	79	30.40	79	30.40	81	30.38	82	30.38	82	30 35	80	30.35	78	30 45	78									18 02	39 21
" 13	30.33	79	30.30	80	30.30	84	30.30	84	30.30	80	30.35	80	30.35	79	30.39	78									14 13	37 58
" 14	30.24	80	30.24	82	30.23	84	30.22	88	30.22	82	30.19	82	30.19	82	30.24	81									10 27	35 58
" 15	30.20	82	30.20	85	30.25	90	30.20	86	30.19	87	30.19	84	30.19	82	30.24	82									6 52	34 36
" 16	30.20	83	30.20	84	30.20	80	30.20	82	30.20	81	30.19	80	30.19	79	30.24	80									3 40	32 50
" 17	30.22	84	30.22	88	30.22	88	30.22	90	30.18	90	33.18	85	30.22	83	30.24	83									3 30	32 50
" 18	30.28	83	30.28	85	30.28	84	30.28	84	30.24	84	30.22	84	30.22	84	30.26	82									1 03	33 38
" 19	30.29	82	30.30	84	30.30	86	30.30	82	30.24	84	30.20	84	30 22	84	30.24	82									2 16 S.	33 53
" 20	30.26	82	30.24	84	30.24	87	30.24	84	30.19	84	30.18	84	30.18	84	30.24	81									4 35	34 23
" 21	30.33	82	30.33	82	30.26	84	30.26	82	30.22	82	30.20	78	30.23	78											6 43	34 45
" 22	30.30	82	30.30	82	30.26	84	30.22	84	30.22	82	30.22	82	30.24	82	30.26	80									8 42	35 05
" 23	30.28	80	30.28	81	30.30	86	30.30	83	30.28	80	30.25	81	30.28	80	30.34	80									11 43	36 32
" 24	30.34	77	30 34	77	30.38	83	30.34	84	30.32	80	30.30	78	30.30	77	30.30	76									15 28	37 20
" 25	30.38	78	30.38	78	30.36	79	30.35	80	30.30	80	30.30	80	30.34	79	30.38	78									18 00	38 22
" 26	30.35	76	30.35	78	30.40	82	30.39	82	30.36	78	30 36	77	30 36	77	30.39	77									20 32	38 12
" 27	30.34	80	30.34	80	30.34	87	30.34	82	30.34	80	30.29	80	30.28	79	30.30	78									23 08	38 15
" 28	30.28	78	30 28	78	30 26	78	30.26	78	30.24	76	30.23	75	30.27	75	30.28	73									24 23	38 35
" 29	30.35	71	30.35	72	30.39	75	30.39	72	30.33	72	30.35	71	30.35	70	30.38	70									24 55	39 00
" 30	30.34	76	30.33	78	30.40	78	30.34	75	30.32	74	30.30	73	30.30	73	30.30	72									26 05	40 00
July 1	30.30	71	30.32	71	30.36	72	35.33	71	30.32	71	30.30	70	30.30	70	30.33	70									28 00	41 00
" 2	30.30	71	30.30	72	30.30	80	30.29	84	30.28	84	30.28	80	30.28	78	30.28	74									29 04	42 05
" 3	30.28	71	30.28	72	30.29	74	30.29	80	30.29	82	30.29	81	30.29	80	30.29	78									29 51	42 08
" 4	30.30	70	30.30	71	30.32	78	30.32	78	30.29	78	30.29	75	30.29	74	30.29	72									30 47	43 24
" 5	30.26	70	30.26	71	30.25	72	30.19	77	30.16	73	30.12	70	30.12	70	30.10	70									32 54	42 54
" 6‡	29.90	71	29.89	70	29.89	68	29.89	70	29.89	67	29.89	65	29.95	64	29.95	64									35 55	46 10
" 7§																										
Aug. 31	30.30	65	30.30	65	30.30	66	30.30	68	30.30	68	30 30	68	30.30	67	30.30	67									23 04	83 15
Sept. 1	30.34	67	30.34	67	30.35	68	30.36	68	30.34	69	30.34	69	30.32	68	30.32	68									21 03	85 15
" 2	30.34	68	30.34	68	30.33	69	30.32	70	30.32	72	30.32	70	30.30	70	30.30	70									18 46	87 30
" 3	30.30	71	30.30	72	30.30	72	30.30	74	30.30	76	30.30	74	30.29	72	30.29	71									16 31	89 57
" 4	30.28	70	30.28	70	30.27	75	30.26	77	30.24	75	30.20	74	30.20	72	30.20	72									14 10	92 50
" 5	30.22	70	30.22	72	30.23	72	30.19	73	30.18	73	30.14	71	30.14	70	30.14	70									12 11	96 30
" 6	30.24	72	30.25	74	30.23	74	30.20	75	30.17	74	30.14	74	30.14	73	30.19	73									10 39	99 00
" 7	30.18	73	30.18	73	30.20	79	30.24	81	30.14	76	30.13	74	30.16	72	30.19	74									9 18	101 30
" 8	30.19	75	30.19	75	30.23	79	30.20	79	30.13	76	30.13	75	30.16	75	30.18	74									9 08	104 48
" 9	30.19	76	30.19	77	30.19	77	30.19	77	30.16	77	30.14	78	30.14	78	30.17	76									9 00	108 13
" 10	30.20	76	30.20	76	30.24	78	30.22	78	30.14	77	30.14	77	30.14	76	30.16	75									8 30	111 40
" 11	30.14	76	30.14	77	30.17	78	30.17	78	39.14	78	30.06	77	30.08	77	30.13	78									5 17	112 00
" 12	30.10	76	30.13	77	30.15	78	30.12	78	30.10	77	30.06	77	30.08	76	30.12	76									1 56	114 00
" 13	30.12	76	30.14	75	30.14	76	30.10	77	30.06	78	30.03	78	30.07	77	30.08	77									0 54 N.	115 10
" 14	30.08	77	30.11	77	30.13	79	30.08	79	30.04	80	30.03	80	30.07	80	30.10	79									4 08	115 25
" 15	30.08	79	30.11	79	30.11	80	30.06	82	30.05	82	30.03	82	30.05	82	30.07	82	30.10	82	30.07	82	30.07	82	30.00	82	6 58	115 52 W.
" 16	30.06	80	30.07	81	30.06	83	30.04	84	30.00	83	29.96	82	30.02	82	30.02	82	30.02	82	30.04	82	30.00	80	30.00	80	9 48	116 00
" 17	30.02	81	30.02	81	30.02	82	29.98	82	29.97	83	29.95	82	29.98	82	30.05	82			30.05	82	30.01	82	30.01	82	11 21	116 35
" 18	30.04	82	30.07	82	30.08	83	30.08	83	30.05	83	30.04	82	30.06	82	30.09	83	30.10	83	30.05	82	30.01	82	30.01	82	12 06	117 03
" 19	30.08	81	30.11	81	30.14	82	30.12	82	30.04	83	30.04	82	30.06	82	30.12	83			30.09	82	30.05	82	30.05	82	13 00	117 35
" 20	30.06	82	30.09	82	30.11	86	30.08	86	30.04	84	30.02	84	30.01	84	30.06	83	30.07	82	30.09	82	30.05	82	30.00	82	13 55	118 00
" 21	30.03	82	30.04	82	30.08	83	30.05	84	29.99	83	30.02	83	30.04	83	30.08	82	30.08	82	30.09	82	30.07	82	30.05	82	13 37	121 10
" 22	30.04	81	30.04	82	30.13	83	30.10	84	30.06	83	30.06	83	30.07	82	30.10	82	30.10	82	30.10	82	30.10	82	30.13	82	14 23	124 10
" 23	30.12	81	30.13	80	30.17	82	30.16	83	30.12	83	30.14	82	30.13	81	30.16	81	30.17	80	30.17	80	30.14	78	30.13	78	15 50	127 00
" 24	30.14	79	30.14	79	30.16	80	30.18	81	30.13	80	30.10	79	30.12	78	30.12	78									17 57	129 40
" 25	30.14	74	30.14	74	30.13	77	30.13	77	30.09	77	30.09	76	30.10	76	30.14	75									20 12	131 45
" 26	30.17	74	30.19	74	30.20	75	30.19	75	30.16	75	30.17	74	30.17	74	30.20	74	30.26	73	30.23	73			30.20	73	22 40	133 45
" 27	30.22	72	30.25	73	30.27	75	30.25	75	30.23	75	30.25	75	30.24	74	30.27	74			30.30	72	30.26	72	30.23	72	24 44	134 58
" 28	30.26	71	30.29	71	30.30	72	30.28	75	30.24	74	30.24	73	30.26	73	30.28	72	30.30	72	30.29	72	30.24	72	30.24	72	26 16	136 30
" 29	30.26	72	30.27	72	30.27	74	30.26	75	30.23	76	30.20	76	30.21	75	30.25	76			30.23	73	30.21	72	30.27	72	27 12	138 00
" 30	30.30	71	30.34	72	30.40	74	30.38	75	30.29	74	30.35	74	30.38	73	30.40	73	30.43	73	30.42	72			30.37	72	28 08	138 24
Oct. 1	30.40	70	30.43	71	30.45	74	30.44	76	30.42	73	30.42	72	30.42	72	30 45	72			30.44	71	30.42	70	30.38	70	30 50	140 45
" 2	30.41	71	30.42	71	30.89	71	30.34	72	30.35	72	30.33	71	30.33	71	30.35	71	30.38	72	30.36	72			30.33	70	32 12	141 55
" 3	30.33	70	30.33	71	30.35	71	30.33	72	30.30	74	30.28	72	30.28	71	30.29	72			30.26	69	30.21	69	30.19	69	32 27	140 42
" 4	30.18	69	30.17	69	30.17	69	30.15	71	30.10	72	30.07	72	30.05	71	30.04	73			29.95	72			29.94	72	33 26	137 00
" 5	29.98	70	30.00	69	30.00	69	29.99	69	29.98	69	29.98	69	29.96	67	30.02	71			30.12	70	30.16	70	30.09	70	34 10	132 55
" 6	30.12	69	30.12	69	30.17	70	30.17	70	30.12	72	30.16	72	30.16	72	30.20	73	30.20	73	30.20	72	30.20	72	30.20	72	33 55	130 30
" 7	30.19	71	30.18	70	30.20	68	30.19	69	30.19	68	30.19	68	30.19	69	30.19	68			30.20	68	30.13	68	30.15	68	33 10	128 20
" 8	30.12	67	30.12	67	30.12	67	30.10	66	30.10	68	30.07	67	30.07	67	30.04	68	30.00	68	30.00	67			29.98	67	33 28	129 40

* The astronomical day commences at *noon*. In this, I commence the day at *six* A. M. previous.

† Ship on fire.

‡ A gale on the 6th.

§ From this to the other side of the Horn, no appearance of *tides*.

"If these tides in the preceding table are produced by the *heat* of the sun, why do we have a *night tide*? If by attraction, why does not the *moon's* influence change the hours of high and low (what shall I call it) mercury? air? as it does with the *water?*"—F. C.

These tides were first observed by Humboldt, I believe. There is an interesting paper upon them by Col. F. C. Sykes, F.R.S., in the *Philosophical Transactions* for 1850, containing hourly observations for three years at Bombay; three years at Madras; and four years at Calcutta; and during that time, these tides failed only once; they were interfered with neither by storm nor calm, monsoon nor trade-wind; but with the regularity of clock-work, the barometer was observed to rise and fall daily and at stated hours so very nearly, that the time of day within a few minutes might have been told by the movements of the mercury. The extreme rise and fall is about one-tenth of an inch, the highest tide occurring about 10 A. M. Then there is a fall and a turn of the tide between 4 and 5 P. M., and so on at intervals of 6 hours.

To get the exact time for the turning of the tide, it is necessary to have a good barometer, reading at least to hundredths (0.01) of an inch, and to observe it at least every five minutes between the hours when the tide turns.

No satisfactory explanation of this phenomenon appears as yet to have been suggested. It may perhaps be connected in some way with magnetism, for there is a tide, so to speak, in the diurnal variation of the needle, and in the intensity of the magnetic forces, which also occurs at stated hours, the year round. The extreme end of the arc of vibration during the great sun-swing of the needle is reached generally between 8 and 9 A. M., and, therefore, precedes by a couple of hours or so the greatest diurnal rise of the barometer. Plate XXII. represents the diurnal march of the needle at Hobarton and St. Helena, and the march of the barometer at Bombay, Madras, and Calcutta. The curves for the former are derived from the discussion by Col. Sabine of the Hobarton observations for 1841, and the St. Helena for 1840–45.

The curves for the latter are simply a transfer from one of the plates which accompany Col. Sykes' paper, already alluded to in the Philosophical Transactions.

The question whether the convolutions of those curves hold to each other the very striking relations they do by chance or by design involves a problem which is yet to be solved.

ROUTE TO CALIFORNIA.

We have now brought the great highway around Cape Horn to another turning off place, or fork of the road. At 50° south, in the Pacific, the South American bound traders part company with the California fleet. Here, or near by, they all, whether bound for Valparaiso, Callao, Guayaquil, or the *Intermedios*, turn off; they have sailed under our guide and in company with us so far, but now they all leave the great California trail to make the best of their way, each to the port of destination. With flowing sheets, and fair winds, the course for the rest of the way is plain. Not a word in addition to what

the Pilot Charts contain, can be said to make the way plainer to them, except the oft-repeated caution, to go straight across the calm belt of Capricorn, turning neither to the east nor west until it is crossed, and the navigator finds himself fairly within the trade-wind region beyond.

The Valparaiso bound vessel should hug the shore close enough to make the land to the southward of her port; those for Callao, &c., keeping straight on.

The California bound vessel should aim to enter the S. E. trade-wind region of the Pacific as far to the west, provided they keep this side of 115° or 120°, as they well can; they should not fight with head winds, to make westing; nor should they turn much from the direct course when the winds are fair. But when winds are dead ahead, stand off to the westward, especially if you be south of the trade-wind region. Having crossed the parallel of 35° S., and taken the trades, the navigator, with the wind quartering and all sails drawing, should now make the best of his way to the equator, aiming to cross it between 105° and 125°, according to the season of the year, and the directions and the tables hereinafter given.

I wish here to call the attention of navigators to the winds they are to expect between the parallel of 50° S., in the Pacific and the equator, especially as it regards their reliability.

In the table of Cape Horn Crossings (p. 617), are given the times from the parallel of 7° S. to the parallel of 50° S., in the Atlantic. The distance between the two parallels there is about 2,900 miles; the average time 27.6 days, and the mean daily run, 105 miles.

The distance from 50° S., in the Pacific, to the usual crossing-place on the line—California track--is about 3,500 miles, the average time 27.8 days, and the mean daily run, 126 miles.

The winds between 50° S. and the equator are so much more strong, steady, and reliable, as the barometer would lead us to expect, on the Pacific, than they are on the Atlantic side of the continent, that the ratio between them in these respects is as 2,900 to 3,500, for it is as easy to make 3,500 miles with them in one ocean, as it is 2,900 in the other.

An examination of the mean monthly passages, from crossing to crossing, will also show a greater regularity, implying thereby more stable winds. The greatest monthly average on the east side is 32 days in August; on the west, 24.8 in November—extreme difference, 7.2 days. The greatest monthly average on the west side is 31 days; the least 24 days—extreme difference 7 days. But a comparison of the tables for a moment only, will show with how much more regularity as to time the passages are made on the one side than they are on the other.

The following communication from Captain Frank Smith, of the Messenger, throws light on what I have already said, and has a bearing upon something that I have to say.

"You will herewith receive my abstract logs of ships Messenger and Susquehanna, on voyages round the world. I am sorry neither of them have been kept as full as you have desired, neither of my ships being provided with *hold cocks;* and I have noted none of my observations for variation of the compass; as, although my attention was at all times directed to the subject, I have rarely found any difference from that marked on the late charts. In the observations noted, I have aimed at correctness and brevity. Should you take occasion to examine the Messenger's log, you will perceive I have had more than a

reasonable, or usual share, of unfavorable winds, light airs, and calms, the *round voyage*, but more especially between New York and San Francisco. I aimed, by the aid of your Charts and Instructions, at maintaining good positions and improving all chances; you will notice, being jammed by a northwester along the coast of Chili, forcing me 10° of long. to the eastward in 6 days, I entered the S. E. trades in 78½° W.; being so far to the eastward, I was induced to follow your proposed track across the equator, and crossed in 102½° W., but I think it too far east, as it is certainly within the influence of some cause producing a *calm space* at that season of the year (September); you will find my remarks at some length, noted in the log, and trust you will make proper allowance for my apparent petulance in complaining, and presumption in expressing an opinion differing from yours, when mine is founded on a limited personal observation, while yours is the result of a mass of information from a multitude of *personal observations*, each of which may be entitled to the same amount of credit as my own. But it requires more than *human powers* of patient endurance, to be from 20 to 25 days becalmed, north of the equator, in the Pacific, on board of a clipper ship, bound to California, when your imagination paints all your competitors passing you to the westward with a breeze; and when I arrived at San Francisco, I found ships in port that had crossed the equator to the westward, days after I did, one of which crossed to the westward of 120° W. Nothing would induce me again to attempt a passage to the eastward of 100° or 115° W.; the very thought of my helpless situation there, still gives me the shuddering *horrors.* I think the last 7 or 8 months past must have been an extraordinary period of tranquillity in all the regions I have passed through. I heard many remarks and complaints of *calm and light airs*, both in California and China, and since I entered the S. E. trades above referred to, I have been over 6 months at sea, 'running down' nearly all the trade-winds that blow, together with the N. E. monsoons of the China Sea, in the season of their strength, and yet I have experienced, in all that *time* and *space*, but 14 days with wind sufficient to keep my *canvas* from *slating* against the *mast*, and only two days in which my skysails were furled throughout 24 hours.

"I deem it but proper to say, ere I close, that I feel myself (in common with the great maritime interests of our country), greatly indebted to your invaluable researches, and the great skill you have developed in laying such a mass of information before us, in such an available form, as we have in your Charts; and I trust your flattering success continues to animate you, and that you will make us in due time as familiar with the great Pacific and Indian Oceans as you have with the Atlantic. That old and beaten track has been brought out of *darkness* into marvellous light, and I expect many important errors have possession of our minds, with regard to the others, which your researches are destined to dispel; and your beautiful theory on the circulation of the atmosphere gives a charm to its study, that cannot fail to excite such an interest on the subject as will make every thinking sailor more attentive and observant of the great laws of nature in action around him. Here I suppose I should close, as I have already written more, perhaps, than you will have leisure or disposition to read; yet, if I felt free to ask questions, and time and place admitted of it, I should be a very teasing *pupil*, as, in the study of your important labors, many suggest themselves to me. For instance, in what latitude, at different seasons, should we look for the southern edge of the S. E. trades in the Pacific; and if they don't prevail farther to the southward, near

the coast of South America, than out to the westward in the open sea? As, in the Susquehanna, in April, 1851, in long. from 87° to 92° W., I had a succession of northers for 7 or 8 days, between lat. 30° and 20° S., while ships to the eastward of me, in the same month, got the S. E. trades in 29° or 30° S. And again, what is the chance of a passage from the west coast of North America to China, in a high latitude, corresponding with packet route from the British Channel to the United States? The length of this admonishes me; but one thing more: what influence has the moon or its phases, on the wind? I have been and continue in the habit of looking for and calculating upon its influence upon wind and weather, especially in the *tropic*, in *trade-winds* and near the land, during full and change; and when studying your Track Chart, with the view of profiting by the experience of others, I always feel the want of some mark on each track by which the moon's age could be known; as, for example, its quarterings so noted as to express the ship's position at the time of their occurrence; then the student, by counting backwards or forwards, could inform himself of the desired particular. Excuse my tediousness, and allow me to conclude, with the expression of my sincere hopes that your very laudable zeal in the pursuit of so useful and patriotic an object as your labors tend to advance, will meet a high and just reward."

Ship Messenger (Frank Smith), New York to California.

June 16, 1852. Lat. 11° 00′ N.; long. 34° 39′ W. Barometer, 30.00; temperature of air, 79°; of surface, 78°. Winds: during the day, E. by N. First part, fine breezes; middle and latter parts, light winds. The sea has been heaving up in rips, and splashing to windward, very much like a weather tide or current.

June 22. Lat. 4° 27′ N.; long. 27° 53′ W. Barometer, 30.05; temperature of air, 80°; of surface, 79°. Winds: S. by W., S. by W., and S. by E. Begins moderate and clear; middle, light airs and cloudy; latter part, moderate and clear. At the beginning, I tacked and stood to the westward, in the hope of coming up on that tack before I reached the long. 30° W. As I found myself in 25° 43′ W. and nearly 6° north, I was apprehensive if I stood farther to the eastward I might run out of the wind, and be baffled with calm and light airs; and I prefer running for a change, to waiting a wind; and I consider it better to beat to windward in short tacks to the west of 25°, than to risk the calms to the east. [A sound conclusion.]

July 20. Lat. 42° 31′ S.; long. 58° 21′ W. Barometer, 29.75; temperature of air, 52°; of surface, 43°. Began with a breeze from the west, which gradually canted to N. W., and freshened to a ten-knot breeze; but before midnight it died away to a calm, and light airs from northward, northward and eastward, and east. This wind, for three days, has drawn gradually around the compass against the sun, from N. E. and E. to S. and W., N. W., and N. E., which I take it is unusual weather. Since passing the parallel of St. Catharine's, have experienced more light and baffling weather than I have encountered for a long time; and what makes it more strange, we have had a new moon during the interval. It is now four days old. [The moon has nothing to do with it.]

August 2. Lat. 57° 28′ S.; long. 74° 05′ W. Barometer, 28.60; temperature of air, 38°; of surface,

38°. Winds: N., N. W., and N. W. Began with northerly winds, which soon increased to a gale. I ran the ship to S. W., taking in sail as required; at 4 P. M. found it necessary to heave the ship to under close-reefed maintopsail and foretopmast staysail; from 3 until 8 P. M., and afterwards in squalls until midnight, it blew a terrific gale; its force seemed irresistible; its sound was deafening, and to look upon it was bewildering. Its strength seemed broken at 8 P. M., or four hours after it commenced. But the squall which followed, when accompanied by hail, seemed sufficient to *flay* everything it met with. I found the barometer of signal advantage to me, as its indications prevented my making or carrying sail, as I should have done if I had not been influenced by it. I was just in time in getting sail off my ship. The barometer fell to 28.60, and there remained during the gale. At meridian, both gale and sea had moderated, when glass rose to 28.90.

Aug. 16. Lat. 32° 48′ S.; long. 80° 10′ W. Barometer, 30.05; temperature of air, 59°; of surface, 56°. Winds during the day, N. W. In looking back, I find this the seventieth day since we have had a wind with which the ship lay her course throughout the day; and this is my seventy-sixth day out—under the circumstances, a short passage to Valparaiso.

Aug. 18. Lat. 24° 01′ S.; long. 80° 36′ W. Barometer, 30.00; temperature of air, 61°; of surface, 60°. Winds: N. W. to W. N. W., W. N. W., S. E. Moderate, light winds throughout, with a floating fog drenching like a rain and flying very low, as the blue sky was always visible over head. The S. W. swell increased to such enormous magnitude as to attract my particular notice, and I endeavored to estimate its height and the distance between the ridges (or caps of the rollers), and I think they were 800 yards apart; and when between, in the trough, the next ridge beyond those forming the trough could not always be seen at an elevation of twenty-five feet above the sea.

Aug. 29. Lat. 21° 09′ S.; long. 83° 07′ W. Barometer, 30.10; temperature of air, 64°; surface, 62°. Winds during the day, S. E.

This has been the first day for seventy-three days that I have had the privilege of recording a fair wind throughout the 24 hours, and this has to be but a light one, but steady. The first 20 hours were overcast, but the last four beautiful and clear; the heavy S. W. swell subsiding, from which I am flattered with the hope we are entering the trades.

Between the equator and 10° or 12° N., according to the season of the year, the California-bound navigator may expect to lose the S. E. and to get the N. E. trade-winds.

He will find these last nearest the equator in January, February, and March; but in July, August, and September, he will sometimes find himself to the north of the parallel of 15° N. before he gets fairly into the N. E. trades. And sometimes, especially in summer and fall, he will not get them at all, unless he keeps well out to the west. Having them, he should steer a good rap full at least, aiming, of course, to cross the parallel of 20° N., in about 125° W., or rather, not to the east of that, particularly from June to November. His course, after crossing 20° N., is necessarily to the northward and westward until he loses the N. E. trades. He should aim to reach the latitude of his port without going to the west of 130° W., if he can help it, or

approaching nearer than 250 or 300 miles to the land until he passes out of the belt of the N. E. trades and gets into the variables, the prevailing direction of which is westerly.

"Where shall we take the S. E. and lose the N. E. trades on the passage to California?" is an important question for the navigator to have answered, who is striving for a short passage on the west coast of South America. From the parallel of Cape Horn up to the belt of light winds and calms, through which you generally pass before getting into the S. E. trades, the prevailing winds are westwardly winds, having northing more frequently than southing in them.

Between the northwest coast and the meridian of 130° W., from 30° to 40° N., the prevailing direction of the wind in summer and fall is from the northward to the westward inclusive; whereas, to the west of 130°, and between the same parallels, the N. E. trades are the prevailing winds of these two seasons. There is a marked difference in the direction of the winds on the opposite sides of the meridian of 130° W. in the North Pacific. The cause of this difference has been completely unmasked by the researches connected with these Charts. The agent which produces it has its seat in the arid plains of New Mexico, Northern Texas, and the regions round about. At this season of the year, the prevailing winds in the western part of the Gulf of Mexico are from the southward and eastward; *i. e.*, towards that great centre of rarefaction. At this season of the year, too, the prevailing winds in the Pacific, off the coasts of Central America, are from the southward, and also towards the same centre of heated plains and ascending columns of air; and we have seen that off the coasts of California, between the parallels of 35° and 40° N., the prevailing winds of this season are from the northward and westward—also towards this great inland "blow hole." In it, is seated a monsoon agent, whose influence is felt for more than a thousand miles out to sea, drawing back the N. E. trades of the Pacific, and converting them into a southwardly monsoon for half the year; deflecting the N. E. trades of the Gulf of Mexico, and converting them into a southeasterly monsoon, during the same season; and so influencing the prevailing S. W. winds off our Northwest Pacific coast, that they, too, are almost made to blow a northwesterly monsoon.

Therefore, vessels bound to San Francisco should not, unless forced by adverse winds, go any farther beyond the meridian of 130° W. than they can help.

Supposing that vessels generally will be able to reach 30° N. without crossing the meridian of 130° W., the distance per great circle from Cape Horn to its point of intersection with that parallel is about 6,000 miles.

And supposing, moreover, that California bound vessels will generally, after doubling Cape Horn, be able to cross the parallel of 50° S., between the meridians of 80° and 100° W., their shortest distance in *miles* thence to 30° N., at its intersection with the meridian of 130° W., would be to cross 40° S. in about 100° W.; 30° S. in about 104°; 20° S. in about 109°; the equator in 117° W.; and 30° N., about 130° W. (126° if you can). By crossing the line 10° farther to the east, or 10° farther to the west of 117°, the great circle distance from Cape Horn to the intersection of 30° N. with 130° W., will be increased only about 150 miles.

Navigators appear to think that the turning-point on a California voyage, is the place of crossing the

equator in the Pacific. But the crossing which may give the shortest run thence to California, may not be the crossing which it is most easy to make from the United States or Europe; and it is my wish to give, in these Sailing Directions, the routes which on the average will afford the shortest passages to vessels that have doubled Cape Horn and are bound direct to California.

First, therefore, let us see which crossings of the equator in the Pacific give the shortest runs on the average thence to San Francisco; then, let us find out which of these crossings it is most easy to reach from Cape Horn, and then, by comparing the two, we may be able to lay down the best route from Cape Horn to California.

Independent of the information that has been elicited by these investigations connected with the Wind and Current Charts, but little was known by navigators as to the winds and currents after doubling Cape Horn, on the California route.

Navigators knew, indeed, that on that route they had to cross the belt both of the S. E. and of the N. E. trade-winds. But in what longitude to cross them; between what meridians are these trade-winds most constant, steady, and fresh; and between what meridians is it less difficult to cross the belt of equatorial calms which separate these two systems of trade-winds; and when, at what distance from the coast, are the light airs and calms of the horse latitudes, which are found on the polar borders of the S. E. as well as of the N. E. trades, less vexatious? These are some of the questions to which definite answers had to be given before it could be asserted with confidence that this or that is certainly the best route to California.

The Pilot Charts, the Track Charts, and proper attention to the tables I am about to give, will tell this to all who consult them diligently.

Having exhausted my materials for Pilot Charts of this route, I have, with the assistance of Lieuts. George Minor and Robert H. Wyman, overhauled the whole series of log-books in my possession, for California passages. From them are derived the following tables of California Crossings, giving the name of the vessel; the year; the number of days' passage from the place of departure in the North Atlantic to the equator in the Pacific; the place and month of crossing the equator; and the number of days thence to California. The crossings on the equator, and of various parallels of latitude, are also given.

Crossings in the Pacific, from 50° S. to the Equator.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
	JANUARY.	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
Hazard	28, 1851	77 00	81 00	83 00	84 00	86 00	109 00	Feb. 21, 1851	24	24
Helena	28, "	78 00	83 00	87 00	91 00	94 00	110 00	" 19, "	22	21
Russell	8, 1850	83 00	83 00	84 00	85 00	89 00	110 00	" 7, 1850	30	37
Cygnet	27, "	84 00	83 00	79 00	81 00	87 00	111 00	" 26, "	30	29
R. C. Winthrop .	31, 1851	82 00	86 00	87 00	90 00	92 00	110 00	Mar. 3, 1851	31	29
Potomac . . .	31, "	80 00	79 00	79 00	83 00	88 00	111 00	" 3, "	31	32
Swordfish . . .	2, 1852	80 00	90 00	94 00	95 00	98 00	110 00	Jan. 21, 1852	19	20
Seaman	28, 1851	79 00	83 00	88 00	92 00	97 00	118 00	Feb. 20, 1851	23	18
Acasta	31, "	82 00	86 00	87 00	91 00	92 00	121 00	Mar. 10, "	38	28
Trade-Wind . .	13, 1853	81 00	87 00	95 00	96 00	99 00	112 00	Feb. 7, 1853	25	16
Contest	19, "	81 00	82 00	84 00	88 00	91 00	111 00	" 9, "	21	16
Tingqua . . .	27, "	80 00	80 00	83 00	85 00	84 00	106 00	" 19, "	23	27
Gray Feather . .	26, "	79 00	81 00	84 00	89 00	89 00	110 00	" 18, "	23	25
Realm	2, "	83 00	85 00	84 00	88 00	92 00	113 00	" 7, "	36	36
Capitol	4, "	81 00	77 00	75 00	73 00	77 00	113 00	" 7, "	34	20
Golden Gate . .	29, "	79 00	79 00	80 00	81 00	82 00	104 00	" 24, "	26	24
Telegraph . . .	25, "	81 00	83 00	85 00	88 00	90 00	110 00	" 17, "	23	21
Samoset	10, 1851	78 00	81 00	82 00	86 00	86 00	108 00	" 18, 1851	39	27
Ann Maria . . .	Dec. 24, '53	83 00	82 00	83 00	87 00	92 00	110 00	Jan. 20, 1854	26	23
Cyclone	14, 1854	82 00	85 00	87 00	94 00	99 00	115 00	Feb. 5, "	21	20
Sam'l Lawrence .	Dec. 31, '53	78 00	80 00	86 00	90 00	95 00	111 00	Jan. 26, "	26	25
Golden City . .	" 26, "	79 00	80 00	84 00	89 00	95 00	114 00	" 18, "	24	20
Eagle	7, 1854	82 00	82 00	87 00	95 00	98 00	112 00	" 28, "	21	19
Arthur	9, "	80 00	83 00	88 00	89 00	93 00	112 00	Feb. 9, "	31	30
Means . . .		80 35	82 06	84 45	88 00	90 35	110 57		27	24.4

Crossings in the Pacific, from 50° *S. to the Equator*—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
	FEBRUARY.	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
Whiton*	16, 1847	80 00	77 00	79 00	80 00	82 00	93 00	Mar. 13, 1847	25	42
Geo. Brown . .	13, 1851	80 00	86 00	88 00	89 00	91 00	105 00	" 14, 1851	29	22
Whiton	11, 1849	84 00	76 00	74 00	78 00	87 00	109 00	" 15, 1849	32	28
Samuel Appleton	26, 1851	79 00	83 00	88 00	90 00	93 00	109 00	" 23, 1851	25	18
Uriel*	28, "	78 00	82 00	85 00	86 00	90 00	110 00	" 30, "	30	34
Surprise . . .	8, "	79 00	82 00	83 00	86 00	88 00	110 00	" 3, "	23	17
Hannibal . . .	23, 1850	95 00	84 00	89 00	93 00	98 00	115 00	" 22, 1850	27	29
Southerner . . .	27, 1851	80 00	85 00	90 00	87 00	88 00	117 00	" 30, 1851	31	28
Newton	4, "	81 00	80 00	79 00	79 00	85 00	117 00	" 10, "	34	26
Canton	28, 1850	85 00	88 00	89 00	94 00	97 00	118 00	" 28, 1850	28	29
Lucia Field . .	5, 1851	78 00	83 00	87 00	91 00	95 00	119 00	" 19, 1851	42	31
Europe	17, 1852	80 00	78 00	76 00	77 00	81 00	100 00	" 17, 1852	28	35
Lantao	23, 1851	81 00	84 00	88 00	92 00	94 00	118 00	" 21, 1851	26	20
A. F. Jenness* .	25, 1853	80 00	76 00	73 00	73 00	78 00	100 00	Apr. 12, 1853	46	54
Kentucky . . .	17, "	83 00	96 00	103 00	107 00	110 00	113 00	Mar. 26, "	37	25
Golden West . .	24, "	81 00	77 00	79 00	84 00	89 00	107 00	" 24, "	28	23
John Bertram . .	17, 1852	84 00	89 00	94 00	95 00	96 00	110 00	" 8, 1852	20	18
Danube	18, 1853	80 00	82 00	83 00	86 00	91 00	110 00	" 23, 1853	33	26
Anna Kimball .	19, "	79 00	83 00	83 00	88 00	92 00	114 00	" 22, "	31	22
Cygnet	6, "	85 00	84 00	83 00	88 00	91 00	109 00	" 8, "	30	30
Thos. Church* .	18, "	78 00	79 00	76 00	79 00	81 00	111 00	" 30, "	48	46
Winged Racer .	13, "	82 00	81 00	84 00	89 00	93 00	106 00	" 7, "	22	21
Flying Childers .	19, "	81 00	83 00	83 00	86 00	92 00	117 00	" 19, "	28	22
Living Age . . .	8, "	79 00	81 00	82 00	87 00	92 00	112 00	" 12, "	32	20
Bald Eagle . . .	23, "	85 00	95 00	99 00	97 00	100 00	111 00	" 23, "	28	19
F. W. Brune . .	1, "	90 00	95 00	96 00	98 00	100 00	107 00	" 2, "	29	29
Storm	20, "	79 00	82 00	83 00	88 00	91 00	110 00	" 17, "	25	28
Alboni	1, "	85 00	94 00	96 00	98 00	102 00	114 00	Feb. 27, "	26	30
Sartelle* . . .	10, 1852	80 00	74 00	80 00	81 00	84 00	107 00	Mar. 10, 1852	28	39
Roman	24, 1853	85 00	91 00	91 00	93 00	98 00	110 32	" 23, 1853	26	25
Eagle Wing . .	19, 1854	78 00	77 00	79 00	83 00	85 00	113 00	" 12, 1854	21	23
Telegraph . . .	10, "	78 00	77 00	77 00	74 00	79 00	106 00	" 23, "	25	24
Means . . .		82 08	79 34	80 19	84 48	91 07	110 12		27.2	24.9

* Not included in the average.

Crossings in the Pacific, from 50° *S. to the Equator*—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
	MARCH.	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
Hurricane . . .	4, 1852	81 00	80 00	82 00	85 00	88 00	103 00	Mar. 22, 1852	18	24
Great Britain . .	25, "	79 00	81 00	74 00	74 00	78 00	104 00	Apr. 28, "	34	30
Sartelle	2, 1850	79 00	80 00	80 00	82 00	85 00	109 00	Mar. 28, 1850	26	34
Howard	5, 1852	80 00	80 00	80 00	83 00	88 00	110 00	" 29, 1852	24	25
Wisconsin . . .	27, "	84 00	83 00	78 00	78 00	82 00	106 00	Apr. 22, "	26	30
Hermann . . .	27, 1850	81 00	76 00	76 00	82 00	87 00	109 00	May 11, 1850	45	37
Daniel	26, 1851	77 00	78 00	77 00	82 00	87 00	113 00	Apr. 28, 1851	33	33
Isette	5, 1850	84 00	87 00	88 00	90 00	92 00	110 00	May 10, 1850	66	37
Stag Hound . .	30, 1851	79 00	77 00	74 00	75 00	81 00	113 00	" 4, 1851	34	21
Isabelita Hyne .	26, "	83 00	81 00	83 00	84 00	88 00	116 00	Apr. 23, "	28	24
Maria	14, "	78 00	77 00	78 00	82 00	85 00	117 00	" 16, "	33	32
Samuel Russell .	17, 1850	84 00	83 00	82 00	81 00	84 00	119 00	" 15, 1850	29	20
Esther May . .	31, 1853	81 00	91 00	93 00	99 00	105 00	113 00	" 28, 1853	28	33
John Holland . .	15, "	79 00	84 00	83 00	82 00	84 00	102 00	" 16, "	32	24
Rattler	18, "	82 00	90 00	90 00	94 00	97 00	114 00	" 16, "	29	23
Golden Eagle . .	30, "	79 00	90 00	97 00	98 00	103 00	113 00	" 20, "	21	19
Eagle	8, "	87 00	92 00	100 00	103 00	104 00	116 00	" 8, "	31	22
Tornado	13, "	84 00	91 00	99 00	96 00	98 00	118 00	" 10, "	28	22
John Stuart . .	14, "	82 00	94 00	99 00	102 00	103 00	112 00	" 10, "	27	24
Celestial	18, "	82 00	83 00	84 00	86 00	91 00	109 00	" 15, "	28	23
Phantom . . .	13, "	84 00	94 00	101 00	105 00	106 00	113 00	" 6, "	24	15
Walter (schr.) . .	11, "	81 00	83 00	87 00	89 00	94 00	108 00	" 9, "	29	25
Susquehanna . .	29, 1851	78 00	80 00	83 00	86 00	90 00	113 00	May 1, 1851	33	30
Elsinore	30, "	81 00	85 00	94 00	91 00	89 00	108 00	" 7, "	38	31
Courser	9, 1852	79 00	80 00	83 00	87 00	92 00	105 00	Mar. 28, 1852	19	31
Flying Cloud . .	17, 1854	80 00	88 00	89 00	91 00	94 00	110 00	Apr. 6, 1854	20	15
Game Cock . .	9, "	79 00	82 00	80 00	79 00	82 00	109 00	" 5, "	26	16
Herald of Morning	22, "	82 00	100 00	103 00	98 00	111 00	119 00	" 16, "	24	20
Archer	18, "	79 00	88 00	91 00	93 00	97 00	112 00	" 7, "	20	22
North Carolina .	11, "	79 00	79 00	81 00	79 00	77 00	95 00	" 15, "	35	42
Means . . .		80 42	80 41	85.42	89 22	93 00	110 06		28.8	26.1

Crossings in the Pacific, from 50° *S. to the Equator*—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
		Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
	APRIL.									
Ocean Bird . .	17, 1849	81 00	76 00	78 00	79 00	78 00	99 00	May 23, 1849	36	38
Anonyma . . .	25, "	78 00	78 00	82 00	86 00	87 00	103 00	" 23, "	28	34
Aurora	18, "	81 00	79 00	73 00	75 00	75 00	110 00	" 30, "	42	31
New Castle* . .	28, "	79 00	78 00	74 00	77 00	80 00	109 00	June 11, "	44	54
F. Depau . . .	4, 1850	78 00	77 00	73 00	74 00	81 00	113 00	May 20, 1850	46	27
Diadem	7, "	81 00	74 00	74 00	89 00	82 00	116 00	" 22, "	45	36
Tornado . . .	24, 1852	83 00	80 00	81 00	85 00	88 00	108 00	" 18, 1852	24	44
Kate Hays . . .	24, "	79 00	76 00	74 00	78 00	82 00	109 00	June 3, "	40	32
Sea Serpent . .	13, 1853	81 00	87 00	85 00	85 00	88 00	102 00	May 5, 1853	22	27
A. Cheseborough	1, "	78 00	85 00	88 00	91 00	95 00	114 00	Apr. 26, "	25	32
Simoom	12, "	88 00	97 00	94 00	91 00	92 00	106 00	May 5, "	23	27
Aldebaran . . .	1, "	85 00	90 00	92 00	98 00	103 00	110 00	Apr. 27, "	26	35
Lucknow . . .	2, "	88 00	99 00	108 00	105 00	103 00	118 00	May 6, "	34	28
Star of the Union	14, "	84 00	93 00	87 00	86 00	88 00	106 00	" 5, "	21	27
Astrea	17, "	84 00	89 00	93 00	96 00	99 00	114 00	" 19, "	32	37
Golden Rover . .	15, "	86 00	93 00	92 00	90 00	91 00	109 00	" 7, "	22	33
Amelia	1, "	81 00	83 00	87 00	96 00	107 00	116 00	Apr. 28, "	27	26
Swordfish . . .	15, "	88 00	91 00	84 00	84 00	89 00	114 00	May 7, "	22	24
Gov. Morton . .	17, "	84 00	87 00	89 00	93 00	96 00	109 00	" 15, "	28	26
Huguenot . . .	Mar. 29, '53	81 00	87 00	92 00	96 00	98 00	113 00	Apr. 19, "	20	26
Seaman's Bride .	7, 1854	88 00	101 00	96 00	97 00	98 00	117 00	May 2, 1854	25	21
Polynesian . . .	19, "	82 00	88 00	88 00	93 00	95 00	110 00	" 18, "	29	29
M. Howes . . .	7, "	86 00	92 00	90 00	90 00	88 00	114 00	" 8, "	31	33
Means . . .		81 49	81 49	87 00	90 08	97 03	110 16		29.4	30

* Not included in the average.

Crossings in the Pacific, from 50° S. to the Equator—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
	MAY.	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
Sweden	29, 1849	80 00	88 00	89 00	90 00	84 00	102 00	June 26, 1849	28	38
Sherwood . . .	30, 1851	81 00	86 00	89 00	91 00	97 00	109 00	" 25, 1851	26	40
Ino	24, "	78 00	81 00	82 00	79 00	82 00	109 00	" 19, "	26	34
Edgar	29, 1850	78 00	77 00	73 00	73 00	78 00	108 00	July 2, 1850	34	39
Henry Pratt . .	1, "	79 00	80 00	78 00	79 00	84 00	110 00	June 7, "	37	41
Archibald Gracie	7, "	83 00	86 00	85 00	85 00	87 00	111 00	" 11, "	35	36
Delia	6, 1851	87 00	91 00	87 00	84 00	85 00	114 00	" 10, 1851	35	34
Arcole	5, "	84 00	98 00	99 00	100 00	102 00	117 00	May 31, 1850	26	30
Kensington . .	3, 1850	81 00	88 00	88 00	89 00	90 00	123 00	June 24, 1851	52	39
Sea Serpent . .	8, 1852	79 00	78 00	79 00	76 00	76 00	102 00	" 6, 1852	29	24
Stag Hound . .	9, "	82 00	88 00	88 00	85 00	81 00	100 00	" 1, "	23	32
Michael Angelo .	31, "	86 00	85 00	83 00	82 00	86 00	102 00	" 27, "	27	35
Rose Standish . .	19, 1850	78 00	81 00	80 00	81 00	87 00	113 00	" 20, 1850	32	44
Ariana	23, 1853	84 00	82 00	83 00	82 00	84 00	117 00	July 1, 1853	39	40
Forrest	9, 1849	82 00	84 00	84 00	83 00	82 00	104 00	June 6, 1849	28	30
Wallace . . .	10, 1852	81 00	84 00	84 00	82 00	82 00	112 00	" 13, 1852	34	38
Eastern State . .	10, "	84 00	82 00	80 00	80 00	85 00	101 00	" 8, "	29	34
Stephen Lurman .	24, "	84 00	83 00	88 00	88 30	89 00	112 00	" 19, "	26	34*
Morgan Dix . .	10, 1850	79 00	80 00	83 00	82 00	83 00	110 00	" 13, 1850	34	37
Gov. Morton . .	21, 1852	81 00	87 00	89 00	87 00	85 00	102 00	" 12, 1852	22	32
Vandalia . . .	1, 1850	83 00	86 00	87 00	87 00	88 00	108 00	" 2, 1850	32	34
Stag Hound . .	1, 1853	78 00	78 00	79 00	79 00	79 00	116 00	" 5, 1853	35	26
Surprise	20, "	84 00	85 00	88 00	91 00	99 00	111 00	" 7, "	18	32
Empress of the Seas	20, "	85 00	84 00	85 00	86 00	91 00	116 00	" 10, "	21	32
Houqua	24, "	83 00	86 00	91 00	98 00	101 00	115 00	" 21, "	28	24
Paragon	21, "	80 00	83 00	88 00	87 00	86 00	113 00	" 18, "	37	42
Parthian . . .	26, "	81 00	83 00	84 00	82 00	88 00	110 00	" 25, "	30	28
Climax	27, "	79 00	80 00	81 00	81 00	86 00	107 00	" 24, "	28	27
Sirocco	13, "	80 00	77 00	75 00	78 00	81 00	111 00	" 11, "	29	29
New York . . .	4, "	80 00	86 00	87 00	86 00	85 00	107 00	" 3, "	30	35
Archer	18, "	84 00	92 00	93 00	95 00	99 00	115 00	" 8, "	21	37
Roscoe	24, "	82 00	80 00	82 00	80 00	82 00	110 00	" 27, "	34	27
Herculean . . .	6, "	80 00	85 00	85 00	83 00	83 00	109 00	" 8, "	33	45
Robert Harding .	24, "	77 00	81 00	83 00	80 00	90 00	116 00	" 28, "	35	39
Seaman's Bride .	24, "	81 00	83 00	83 00	88 00	92 00	115 00	" 19, "	26	29
Lantao	26, "	79 00	80 00	81 00	80 00	78 00	106 00	" 23, "	28	30
Hampton . . .	24, "	79 00	80 00	79 00	77 00	76 00	102 00	" 29, "	36	40
Hugh Birckhead .	20, "	79 00	78 00	78 00	81 00	86 00	109 00	" 17, "	28	33
C. L. Bevan . .	3, "	78 00	82 00	84 00	85 00	87 00	103 00	" 2, "	30	46
Storm King . .	26, "	79 00	79 00	79 00	76 00	77 00	106 00	July 3, "	37	24
Santiago . . .	26, "	80 00	80 00	82 00	82 00	88 00	113 00	June 26, "	30	32
Cynthia	8, 1854	84 00	86 00	91 00	89 00	91 00	110 00	" 8, 1854	31	53
R. B. Forbes . .	24, "	86 00	87 00	86 00	89 00	92 00	114 00	" 25, "	31	31
Means . . .		81 38	84 47	86 39	88 13	90 34	109 54		30.4	31.6

* San Diego.

Crossings in the Pacific, from 50° S. to the Equator—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
	JUNE.	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
Gazelle	7, 1849	80 00	80 00	80 00	82 00	84 00	106 00	July 9, 1849	32	30
Clarissa Perkins .	24, "	78 00	82 00	81 00	81 00	83 00	114 00	" 30, "	36	43
Venice	6, 1850	80 00	80 00	79 00	80 00	80 00	115 00	" 14, 1850	38	30
Sarah and Eliza .	26, 1849	82 00	81 00	76 00	76 00	85 00	114 00	Aug. 12, 1849	47	36
Raduga	26, 1851	81 30	80 00	78 00	78 00	76 00	118 00	July 28, 1851	32	25
Sheridan . . .	1, 1850	80 00	84 00	90 00	92 00	90 00	118 00	" 2, 1850	31	28
Tartar	29, 1851	82 00	85 00	86 00	91 00	95 00	122 00	" 24, 1851	25	30
T. B. Wales . .	3, 1852	81 00	83 00	83 00	85 00	90 00	103 00	" 3, 1852	30	33
Louisa Bliss . .	1, 1850	79 00	75 00	72 00	74 00	77 00	99 00	" 8, 1850	37	52
Empire	5, 1852	78 00	38 00	93 00	95 00	99 00	102 00	" 8, 1852	33	36
Cohota	23, 1850	84 00	89 00	91 00	96 00	95 00	110 00	" 19, 1850	26	23
Horsburgh . . .	4, 1852	79 00	77 00	77 00	80 00	84 00	98 00	June 29, 1852	25	35
North American .	26, "	80 00	76 00	74 00	76 00	79 00	101 00	July 28, "	32	33
R. C. Winthrop .	9, "	78 00	82 00	86 00	91 00	93 00	104 00	" 12, "	33	33
Abbott	15, "	81 00	78 00	78 00	80 00	84 00	112 00	" 22, 1853	37	40
Competitor . . .	2, 1853	79 00	89 00	94 00	96 00	99 00	112 00	June 23, "	21	26
Hornet	28, "	79 00	87 00	92 00	95 00	102 00	113 00	July 23, "	25	20
St. Lawrence . .	1, "	79 00	86 00	91 00	92 00	98 00	116 00	June 25, "	24	41
White Squall . .	8, 1852	78 00	79 00	79 00	80 00	82 00	100 00	July 2, 1852	24	26
Harriet Hoxie .	4, "	77 30	78 00	72 00	76 00	84 00	103 00	" 6, "	32	28
Sarah Boyd . .	6, 1850	78 00	80 00	80 00	83 00	85 00	115 00	" 15, 1850	39	32
John Land . . .	29, 1853	86 00	93 00	95 00	102 00	103 00	113 00	" 25, 1853	26	31
Flying Eagle . .	6, "	82 00	94 00	99 00	101 00	106 00	114 00	" 7, "	31	34
Eliza Thornton* .	May 29, '53	79 00	84 00	84 30	87 00	90 00	117 00	" 9, "	41	42
Benj. Howard . .	1, 1853	81 00	89 00	95 00	99 00	105 00	120 00	" 6, "	34	34
Cleopatra . . .	30, "	86 00	89 00	87 00	82 00	87 00	122 00	Aug. 3, "	34	27
Surprise . . .	5, "	82 00	94 00	95 00	93 00	90 00	112 00	June 30, 1854	25	32
Means . . .		80 32	84 11	86 34	89 06	92 09	110 36		31	32.2
	JULY.									
St. Patrick . . .	19, 1850	81 00	90 00	92 00	93 00	95 00	115 00	Aug. 14, 1850	26	30
Isaac Allerton .	17, "	81 00	93 00	96 00	97 00	99 00	111 00	" 13, "	27	34
Caroline	15, "	81 00	82 00	86 00	88 00	93 00	113 00	" 11, "	27	34
N. B. Palmer . .	10, 1851	86 00	88 00	89 00	91 00	93 00	114 00	" 2, 1851	22	19
Witch of the Wave	27, "	83 00	85 00	86 00	87 00	88 00	115 00	" 18, "	22	32
Finland	2, 1850	89 00	104 00	106 00	108 00	114 00	117 00	" 6, 1850	35	42
Flying Cloud . .	26, 1851	81 00	90 00	94 00	96 00	101 00	124 00	" 12, 1851	17	19
Staffordshire . .	8, 1852	79 00	85 00	86 00	87 00	94 00	110 00	" 25, 1852	48	18
Victory	2, 1853	84 00	90 00	88 00	83 00	90 00	113 00	" 2, 1853	31	32
N. B. Palmer† .	30, 1852	79 00	78 00	73 00	73 00	81 00	111 00	Sept. 7, 1852	39	22
Channing . . .	5, 1853		85 00	86 00	88 00	91 00	115 00	Aug. 9, 1853	34	35
Oxnard	5, "	79 00	84 00	85 00	89 00	93 00	116 00	" 8, "	33	34
J. H. Shepherd .	June 30, '53	85 00	94 00	93 00	98 00	102 00	114 00	" 1, "	32	43
Amazon	5, 1853	86 00	92 00	95 00	97 00	100 00	121 00	" 4, "	35	42
Levanter . . .	30, "	81 00	95 00	94 00	95 00	105 00	117 00	" 26, "	27	32
Linwood . . .	12, "	83 00	88 00	85 00	90 00	97 00	117 00	" 9, "	28	26
Mary Annah . .	3, "	83 00	87 00	82 00	88 00	93 00	116 00	" 9, "	38	38
Highflyer . . .	9, "	82 00	87 00	87 00	90 00	95 00	117 00	" 4, "	27	29
White Squall . .	22, "	81 00	80 00	79 00	81 00	82 00	110 00	" 13, "	22	22
Celestial Empire .	15, "	79 00	81 00	83 00	88 00	94 00	117 00	" 21, "	36	31
Means . . .		81 06	87 54	88 25	90 20	95 00	115 10		29.4	30.1

* Via St. Catharine's; not included in the average.

† Touched at Valparaiso.

Crossings in the Pacific, from 50° S. to the Equator—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
		Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
	AUGUST.									
Chatham . . .	22, 1849	78 00	78 00	78 00	80 00	81 00	99 00	Sept. 22, 1849	31	39
Templeton . . .	11, 1850	84 00	87 00	86 00	90 00	91 00	113 00	" 10, 1850	30	27
Lady Arabella .	5, "	83 00	83 00	81 00	86 00	93 00	113 00	" 4, "	30	33
Virginia . . .	5, "	84 00	90 00	93 00	96 00	100 00	113 00	" 2, "	28	33
Copeland . . .	16, 1852	87 00	87 00	88 00	89 00	91 00	104 00	" 7, 1852	22	39
Carioca	10, "	84 00	85 00	87 00	86 00	88 00	101 00	" 6, "	27	41
Union	10, "	84 00	85 00	85 30	87 00	88 00	101 00	Aug. 31, "	21	28
Southerner . . .	5, "	79 00	78 00	75 00	75 00	79 00	111 00	Sept. 15, "	41	34
Witch of the Wave	28, "	83 00	82 00	80 00	79 00	86 00	114 00	" 21, "	24	27
Eliza Mallory . .	11, "	82 00	85 00	84 00	86 00	88 00	108 00	" 10, "	30	37
Samoset	11, "	83 00	82 00	83 00	87 00	91 00	107 00	" 5, "	25	42
Union	11, "	86 00	85 00	85 00	87 00	89 00	101 00	Aug. 31, "	20	28
Messenger . . .	3, "	83 00	87 00	82 00	79 00	80 00	103 00	" 29, "	26	34
Flying Dutchman	20, 1853	86 00	91 00	93 00	99 00	101 00	119 00	Sept. 8, 1853	19	28
Greenwich . . .	31, "	80 00	85 00	90 00	98 00	105 00	116 00	" 16, "	26	27
Young America .	11, "	83 00	85 00	93 00	98 00	100 00	116 00	" 7, "	18	22
Atalanta . . .	3, "	80 00	91 00	89 00	91 00	96 00	115 00	Aug. 28, "	25	40
E. C. Sronton . .	19, "	81 00	89 00	92 00	98 00	101 00	112 00	Sept. 17, "	30	39
Harrisburg . . .	19, "	79 00	86 00	89 00	95 00	96 00	112 00	" 20, "	32	39
Belle of the West	16, "	82 00	84 00	89 00	93 00	98 00	112 00	" 5, "	19	24
Anglo-Saxon . .	20, "	88 00	91 00	96 00	97 00	99 00	121 00	" 18, "	29	23
West Wind . .	1, "	78 00	91 00	91 00	91 00	92 00	112 00	" 24, "	24	34
Cyane	17, "	81 00	85 00	92 00	97 00	101 00	116 00	" 12, "	26	32
Avondale . . .	7, "	86 00	90 00	91 00	92 00	96 00	112 00	Aug. 30, "	23	29
Reindeer . . .	18, "	80 00	80 00	79 00	80 00	87 00	113 00	Sept. 17, 1854	30	38
Golden State . .	10, "	80 00	84 00	84 00	87 00	91 00	112 00	" 4, "	25	24
Means . . .		82 25	85 41	86 46	89 20	92 19	110 37		26.2	32.4
	SEPTEMBER.									
Angelique . . .	25, 1849	79 00	79 00	74 00	75 00	78 00	99 00	Oct. 29, 1849	34	44
Mermaid . . .	2, 1851	80 00	85 00	87 00	88 00	91 00	106 00	Sept. 21, 1851	19	27
Telegraph . . .	27, "	81 00	82 00	82 00	81 00	84 00	110 00	Oct. 22, "	25	23
Celestial . . .	24, 1850	84 00	90 00	90 00	91 00	96 00	115 00	" 11, 1850	18	20
Thomas Perkins .	29, 1849	79 00	78 00	77 00	80 00	86 00	111 00	" 25, 1849	26	26
Eagle	28, 1851	85 00	88 00	89 00	90 00	90 00	115 00	" 20, 1851	22	28
Carrington . . .	13, 1850	83 00	88 00	88 00	88 00	90 00	115 00	" 5, 1850	22	26
Gertrude . . .	16, "	83 00	90 00	93 00	95 00	100 00	116 00	" 8, "	22	30
Cohota	8, 1852	80 00	86 00	88 00	88 00	89 00	105 00	" 6, 1852	28	26
Albany	8, "	79 00	87 00	89 00	89 00	90 00	101 00	" 6, "	28	38
John Bertram . .	11, 1853	86 00	87 00	89 00	90 00	93 00	114 00	Sept. 29, 1853	18	24
Rubicon	4, "	80 00	85 00	80 00	80 00	83 00	114 00	" 12, "	37	32
Horsburgh . . .	12, "	81 00	81 00	82 00	79 00	82 00	109 00	Oct. 7, "	24	34
Kate Hays . . .	14, "	82 00	78 00	75 00	77 00	84 00	110 00	Nov. 6, "	35	21
Winfield Scott .	22, "	81 00	82 00	85 00	91 00	96 00	115 00	Oct. 29, "	37	28
Windward . . .	11, "	84 00	84 00	86 00	84 00	86 00	116 00	" 4, "	22	29
Whistler . . .	24, "	81 00	82 00	86 00	91 00	93 00	109 00	" 31, "	37	24
F. P. Sage . . .	15, "	83 00	86 00	90 00	94 00	96 00	116 00	" 18, "	31	34
Wild-Duck . . .	23, "	84 00	83 00	81 00	88 00	96 00	115 00	" 21, "	27	24
Sandusky . . .	7, "	81 00	82 00	83 00	85 00	86 00	114 00	" 5, "	28	34
Sunbeam . . .	22, "	80 00	80 00	83 00	91 00	93 00	115 00	Nov. 3, "	42	24
Means . . .		81 48	83 57	84 22	86 20	90 00	111 14		27.7	28.4

Crossings in the Pacific, from 50° *S. to the Equator*—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF—					Longitude of crossing the equator.	Date of crossing the equator.	Days from 50° S. to the equator.	Days from the equator to San Francisco.
		50° S.	40° S.	35° S.	30° S.	25° S.				
		Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
	OCTOBER									
Sea Witch . . .	5, 1851	79 00	84 00	86 00	85 00	86 00	101 00	Oct. 27, 1851	22	23
Boston	23, 1849	80 00	78 00	75 00	74 00	78 00	106 00	Nov. 27, 1849	31	40
Raven	5, 1851	79 00	81 00	84 00	85 00	85 00	112 00	Oct. 29, 1851	24	20
Talbot	13, 1850	82 00	82 00	83 00	85 00	88 00	115 00	Nov. 12, 1850	29	31
Valparaiso . . .	1, 1851	84 00	83 00	86 00	86 00	91 00	115 00	" 2, 1851	32	30
Samuel Russell .	27, 1852	82 00	83 00	83 00	83 00	85 00	101 00	" 17, 1852	21	21
Winged Arrow .	15, "	83 00	81 00	85 00	90 00	93 00	115 00	" 4, "	20	23
Sea Witch . . .	29, "	79 00	86 00	84 00	87 00	93 00	114 00	" 21, "	23	18
Typhoon . . .	6, 1851	78 00	83 00	86 00	84 00	86 00	115 00	Oct. 31, 1851	25	18
Raven	13, 1852	80 00	82 00	81 00	85 00	88 00	105 00	Nov. 3, 1852	21	26
Seaman	19, "	77 00	78 00	78 00	79 00	84 00	109 00	" 13, "	25	26
Sover'gn of the Seas	1, "	78 00	86 00	98 00	100 00	109 00	120 00	Oct. 28, "	27	17
Matilda	22, "	79 00	82 00	82 00	84 00	89 00	108 00	Nov. 27, "	36	25
Seaman	18, "	77 00	78 00	78 00	80 00	84 00	109 00	" 13, "	26	26
Defiance . . .	15, "	83 00	79 00	83 00	86 00	89 00	105 00	" 7, "	23	25
Comet	21, 1853	84 00	86 00	87 00	89 00	90 00	116 00	" 15, 1853	25	25
Trade-Wind . .	24, "	85 00	93 00	93 00	90 00	91 00	115 00	" 16, "	23	24
Mandarin . . .	22, "	83 00	86 00	87 00	84 00	86 00	112 00	" 19, "	27	22
Hurricane . . .	21, "	83 00	78 00	80 00	81 00	84 00	114 00	" 18, "	27	22
North Wind . .	22, "	78 00	83 00	81 00	81 00	86 00	115 00	" 21, "	29	22
Witch of the Wave	24, "	87 00	94 00	97 00	96 00	95 00	115 00	" 14, "	21	26
Raven	26, "	83 00	88 00	87 00	87 00	90 00	109 00	" 16, "	22	25
Arab	26, "	84 00	86 00	85 00	87 00	92 00	114 00	" 24, "	28	42
Wisconsin . . .	27, "	84 00	83 00	82 00	84 00	88 00	112 00	" 24, "	27	27
Hero*	Sep. 22, '53	83 00	84 00	83 00	90 00	96 00	114 00	Oct. 27, "	34	29
Means . . .		81 19	83 27	84 37	84 45	88 45	111 20		25.6	25.1
	NOVEMBER.									
Horton	11, 1850	80 00	78 00	75 00	80 00	86 00	109 00	Dec. 23, 1850	42	33
Comet	28, 1851	84 00	90 00	89 00	92 00	94 00	117 00	" 28, 1851	30	16
Wessacumcon . .	16, 1852	83 00	81 00	84 00	86 00	88 00	100 00	" 16, 1852	30	27
Delegate . . .	22, "	82 00	83 00	84 00	86 00	88 00	106 00	" 15, "	23	24
Raduga	12, "	80 00	82 00	80 00	76 00	79 00	108 00	" 9, "	27	26
Chas. Mallory . .	24, "	89 00	85 00	85 00	85 00	87 00	108 00	" 17, "	23	24
Malay	26, "	87 00	88 00	87 00	86 00	87 00	106 00	" 16, "	20	25
Golden City . .	22, "	81 00	88 00	88 00	92 00	97 00	115 00	" 16, "	24	18
Arcole	13, "	79 00	78 00	76 00	74 00	78 00	96 00	" 8, "	25	25
John Wade . .	29, 1851	86 00	81 00	82 00	86 00	92 00	108 00	" 22, 1851	23	22
Senator	26, 1852	81 00	85 00	85 00	90 00	96 00	111 00	" 25, 1852	29	34
John Wade . .	22, "	83 00	89 00	90 00	91 00	94 00	110 00	" 15, "	23	23
Monsoon . . .	13, "	80 00	82 00	80 00	76 00	81 00	104 00	" 6, "	23	25
Thos. W. Sears .	24, "	86 00	84 00	83 00	84 00	87 00	113 00	" 21, "	27	23
John Wade . .	2, 1853	97 00	102 00	105 00	110 00	112 00	117 00	Nov. 27, 1853	24	24
Unknown . . .	28, "	79 00	78 00	82 00	85 00	91 00	113 00	Dec. 19, "	20	21
Wizard	6, "	86 00	88 00	92 00	96 00	102 00	116 00	Nov. 27, "	21	22
Means . . .		83 21	84 49	87 32	86 11	90 31	109 14		24.2	23.8

* Not included in the average.

Crossings in the Pacific, from 50° S. to the Equator—Continued.

NAME OF VESSEL.	Date of crossing parallel of 50° S.	LONGITUDE OF CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	Longitude of crossing the equator.	Date of crossing the equator.	Days from 20° S. to the equator.	Days from the equator to San Francisco.
	DECEMBER.	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′	Long. W. ° ′		Days.	Days.
Golden Gate . .	20, 1851	83 00	82 00	82 00	82 00	85 00	106 00	Jan. 12, 1852	23	23
John Jay . . .	30, 1849	79 00	78 00	74 00	74 00	78 00	105 00	Feb. 6, 1850	37	37
Ambassador . .	19, "	78 00	78 00	81 00	85 00	87 00	113 00	" 26, "	38	32
Tigress	2, 1850	82 00	80 00	80 00	81 00	85 00	114 00	June 1, "	*	33
Flying Fish . .	31, 1851	79 00	79 00	83 00	89 00	93 00	120 00	Jan. 22, 1852	22	23
White Squall . .	1, 1850	81 00	80 00	79 00	82 00	83 00	118 00	Dec. 24, 1850	23	14
Westward-Ho . .	20, 1852	79 00	82 00	82 00	86 00	92 00	122 00	Jan. 13, 1853	24	18
Comet	4, "	84 00	89 00	89 00	90 00	95 00	114 00	Dec. 27, 1852	23	20
Flying Dutchman	22, "	89 00	93 00	93 00	95 00	100 00	110 00	Jan. 10, 1853	19	16
Revere	4, "	84 00	87 00	86 00	87 00	92 00	109 00	" 2, "	29	27
Flying Fish . .	25, "	80 00	79 00	82 00	87 00	92 00	112 00	" 13, "	19	18
John Gilpin . .	26, "	84 00	80 00	82 00	87 00	91 00	116 00	" 15, "	20	15
Wild Pigeon . .	25, "	85 00	81 00	82 00	86 00	91 00	111 00	" 13, "	19	26
Adelaide . . .	28, "	78 00	77 00	79 00	79 00	79 00	104 00	Feb. 5, "	39	35
Anstiss	28, "	79 00	79 00	80 00	82 00	86 00	110 00	Jan. 22, "	25	25
Westward Ho . .	21, "	82 00	82 00	82 00	86 00	91 00	120 00	" 12, "	23	19
Manchester . .	1, "	81 00	78 00	74 00	79 00	84 00	107 00	" 5, "	23	26
Franconian . .	25, "	83 00	79 00	81 00	83 00	88 00	113 00	" 20, "	26	26
Morning Light .	22, 1853	83 00	82 00	83 00	84 00	90 00	113 00	" 17, 1854	25	23
Ringleader . . .	24, "	80 00	81 00	83 00	83 00	85 00	110 00	" 15, "	21	25
Skylark . . .	1, "	78 00	84 00	87 00	89 00	90 00	114 00	Dec. 25, 1853	25	21
N. B. Palmer . .	10, "	80 00	82 00	86 00	88 00	93 00	112 00	Jan. 1, 1854	22	26
Onward	7, "	80 00	82 00	85 00	87 00	95 00	113 00	" 4, "	28	21
Winged Arrow .	2, "	78 00	83 00	86 00	87 00	93 00	118 00	Dec. 27, 1853	25	18
Bald Eagle . . .	13, "	81 00	85 00	85 00	86 00	90 00	113 00	Jan. 4, 1854	22	21
Sam'l Russell . .	8, "	81 00	81 00	82 00	84 00	87 00	117 00	Dec. 31, 1853	23	20
Parthenon . . .	14, "	81 00	81 00	81 00	84 00	91 00	113 00	Jan. 8, 1854	25	31
Eureka	24, "	86 00	83 00	84 00	84 00	87 00	110 00	" 15, "	22	21
		81 21	81 40	82 36	84 40	89 02	112 45		24.8	23.3

Now, let us examine these crossings by the month. From the United States to the line, and thence clear of St. Roque, the table of crossings (pp. 456–67) has been given. It shows the average time to the parallel of St. Roque for each month, and the actual time by each ship.

The table of Cape Horn crossings (pp. 617–22) shows the time from the parallel of St. Roque; also for each ship arranged according to the month to the parallel of 50° south in the Atlantic; also the time occupied in the passage thence around Cape Horn to the same parallel in the Pacific.

The tables under discussion show the time from 50° south in the Pacific to the line, and thence to California; likewise for each vessel in detail, and every month by the average.

Now, from the United States to the parallel of St. Roque, the average distance is about 4,500 miles, and the average time for January 31 days, with a mean daily distance of 133 miles per vessel.

From St. Roque to the parallel of 50° south in the Atlantic, the average distance is 2,900 miles, and the average time in January is 24½ days, with a mean daily distance of 118 miles per vessel.

From the parallel of 50° south, in the Atlantic, around the Horn to the same parallel in the Pacific, the average distance is 1,400 miles; the average time for January is 16 days, with a mean daily distance of nearly 90 miles per vessel for that month.

From 50° south, in the Pacific, to the line, the average distance is 3,500 miles; the average time in January 27 days, and the mean daily distance by straight lines from noon to noon is 130 miles per vessel.

From the line to San Francisco, the average distance is about 3,000 miles; the average time in January 24 days (one day less than it was last year), and the mean daily distance 125 miles.

Now, with this statement as to the distance from crossing to crossing, and the tables as to the time by vessels taken singly and in monthly groups, the navigator has always the means before him of knowing when he falls behind on this long journey, and when he head-reaches, where and how much. He will also have no difficulty in finding out which are the most tedious parts of the passage. I attach great practical importance to the bearing of the tables and Sailing Directions in this respect, because they are calculated to excite emulation and keep the ship always up to her metal.

The January crossings of 50° S. in the Pacific give February crossings for the line. The times, both north and south of the line, show a uniformity and an average that encourage hopes, on the part of the navigator, for a good run, at this season, up to the Heads of San Francisco. If he have already had a fair passage from his North Atlantic port to 50° S. in the Pacific, he may now calculate on a good passage. The difference between the shortest passage from that parallel to the line and the mean, is eight days; between the longest and the mean, eleven days.

For quick runs, the Contest carries off the palm among the January crossings. She performed the run from 50° S. to San Francisco, in the very excellent time of thirty-seven days. This run, however, *can* be made in thirty-five days, for the Sword-Fish went from 50° S. to the line in 19 days, and both the Trade-Wind and the Contest went thence to California in the same month, each in sixteen days. But it is only now and then that a vessel will be able to strike a vein of wind and a run of luck, which will carry her through with the speed that the passage of thirty-five days from 50° S. requires.

In February, the A. F. Jenness comes along to spoil averages again. She requires more than double the usual time from the line, and nearly twice as much time as vessels usually do. She has been far behind time all the way, and is therefore, I presume, an extraordinarily slow vessel. She had to be rejected from the averages of the passages from the U. States to the line; again, from the Cape Horn averages. She is an exception, and, on this account, I again reject her from the averages here. So, also, the Thomas Church.

The John Bertram bears off the palm for this month, by her run of thirty-eight days from 50° S. to the Heads. The Surprise and the Winged Racer contended with her for the prize. But the Bertram seems to have won it by keeping well to the westward while south of the line, and so putting herself in the full strength of the S. E. trades, and other winds, and where they are uninfluenced by the land.

She crossed 50° S. to the westward of either of the others, and took the S. E. trades still farther to the west. At the line, their crossing was the same. From the line, the Surprise only led her into San Francisco, and she by one day only.

The shortest passage, probable, from 50° S. in February, to San Francisco, under canvas, is thirty-seven days. This is the shortest time in which, judging by our experience so far, it is possible for a ship ever to accomplish that part of the voyage; to make it in a shorter time is possible, but the chances for any given ship to do it are but small and few. But, generally, in this month, also, winds are fine, and chances fair.

In March, the Isette requires time enough for two trips to the line from 50° S. She is an uncommon case, and Lieut. Minor, who compiled these Tables, has rejected her from the means, as one of those vessels which these Sailing Directions can do very little towards helping along, for when they get into good winds they have not the capacity to profit much by them.

Now, the navigator will observe a little more uncertainty as to the time it will take him to go from 50° S. to California. Here, the difference between the shortest run to the line and the mean, is 11 days; in January, it was 8. Also, the difference between the longest time and the average to the line, is 16 days; in January, it was but 11. Unequal, uncertain times, are the exponents of uncertain and unsettled winds.

In April, the Newcastle is the black sheep. Her performance, because it is out of rule, and an exception to that of ships generally, is rejected from the means.

In April, there is seldom a succession of very good winds. In this month the average winds of the winter months prevail for a little more than half the time south of the line, and for about one-third north.

Some fine ships are in the April fleet; there are about a dozen of them; yet one-third of the whole number in January bear off, each one of them, the palm from the best one of these; not so much, as the Charts show, by reason of better heels as by reason of better winds.

The probabilities are, that many ships will pass this way in April before one is found to beat the Sword-Fish; for, though she had 46 days from 50° S. to "The Heads," there is but one, the Star of the Union, that led her to the line—and she only a day—and there is not one that came within hail of her thence to San Francisco. She made the whole run in 46 days; 45 is the possible minimum limit for this month. This was said a year ago; since then, two ships, viz: the Huguenot and Seaman's Bride, have made the run in the same time.

In May, we will take the Arcole into the account, though her passage does exceed the mean, 22 days. In this month, though the passage is much more tedious than in the winter months, yet it is nearly as certain. The difference between the extremes, and the mean, being 12 and 9 for May, 8 and 11 for January, 9 and 13 for February, and 7 and 13 for December.

In this month, though the average from 50° S. to the line is about the same as the average from the equator to San Francisco, yet we are struck with the contrast which the individual cases afford as to the prevailing character of the winds, north and south of the equator.

On the north side, the greatest difference between the mean and the extreme is with the maximum; on the south side, it is with the minimum; showing that, from 50° S. to the line, a vessel is much more liable to meet with winds that will drive her a week or ten days ahead of her time, than she is with airs and calms, that will keep her back even for 7 days. While north of the line, she is much more liable to

be beset by calms and airs, that will keep her from 10 days to two weeks behind the average, than she is to meet with winds that will set her 5 days even ahead of the average.

The clever and observant mariner may gather from these tables of crossings much valuable information as to the character and strength of the winds he is to expect.

As an example, take the May crossings. Suppose the average from 50° S. to the line was 30 days, as it is, and that, in casting his eye up the column, "Days from 50° S. to the line," he should see all the passages ranging from 24 to 26 days, except some three or four, and that these should be 60, 40, and so on. He would conclude that, generally speaking, he was pretty sure in this month of regular or certain winds, and that it is only occasionally that navigators would be delayed here for the want of winds.

Suppose, on the other hand, when he casts his eye up the other column, to examine the time of each ship from the line to San Francisco, greater irregularities are observed, as one passage of fourteen days, another of sixty, and so on; what would be his conclusion? Why, certainly, that in that part of the ocean, in May, the winds would be most uncertain; sometimes a roaring storm, sometimes a raging calm; but always extremes, and that no reasonable reliance could be placed on them.

It is hard to go quickly to San Francisco from the line at this season. The Sea Serpent, the Houqua, and the Storm King, have all done it in twenty-four days; but they were respectively twenty-eight, twenty-nine, and thirty-seven days from 50° S. On this part of the route, though they did their best, they fell behind the Stag Hound, the George Morton, the Empress of the Seas, the Archer, and, more than all, the Surprise, from a week to twenty days.

A vessel that shall make the run from 50° S., in May and June, to the Heads of San Francisco in forty-two days, will win laurels for her master.

There is a general disposition in the public mind to judge of the prowess of a ship, and the skill of her captain, according to the length of her voyage, and the quickness of her trip, without regard to the season when the run is made, or the prevailing character of the winds in those parts of the ocean through which the voyage lies. No rule can be more unfair to both ship and master. Take the table of crossings from the United States to the line in the Atlantic—pp. 456-67.

Thus, it will be observed that the average passage to the line differs as much as 12 days, according as it may be made in this month or that; and the ship and master who in December make the run in 25.6 days, do no better than they who in September may have accomplished it in 37.3 days.

In June, thirty-one days is the average from 50° S. in the Pacific to the line; and a vessel here is more apt to be a week ahead of the average than she is to be a week behind her time. This results from the fact that a great many vessels are a day or two behind time, with occasionally one a great way ahead. Of course, this brings down the average. A bad month is June from the equator north, as it is from 50° S. to the equator.

In July begins the dawn of better times. There is the Flying Cloud's famous performance of seventeen days from 50° S. to the line, and nineteen thence to the Heads, to grace this month. The Staffordshire, in this month, too, had eighteen, and the N. B. Palmer nineteen, days each, also from the line.

August and September are both good months south of the line. But from the line up, the navigator

finds his patience, quite as much as his skill, brought into requisition. The influence of the American plains and deserts begins now to make itself felt upon the N. E. trade-winds, paralyzing them, or turning them back, and converting them into breezes that baffle and perplex. I have said much as to the causes which, in these months, make the passage along here so vexatious.

In October, the winds are decidedly better and more steady, both north and south of the equator.

There are the Winged Arrow, with 20, and both the Raven and the Samuel Russell, each with her 21 days in this month, from 50° S.; and from the line north, we have the Sovereign of the Seas, with 17, and both the Typhoon and the Sea Witch, each with 18 days.

If we throw out from the average the forty days of the Boston, which appear to be owing to some defect of the ship, quite as much as to any want of winds, we shall have the very slight difference between the mean and extremes of this month, both to and from the line, viz: 6 and 10 days to, with 8 and 6 from the line.

In November, the chances for a good run from 50° S. to California, are still better. In this month, though we have more vessels, yet the difference between the mean of the whole and the extremes, *i. e.*, the best and the worst of all the passages made to the line, is 5 and 6 days. Few passages, through trades, calms, and variables, for 3,500 miles, are more regular on the average than this.

In December, we have the best running and the best averages of all. It was in this month that the Comet crossed the line in 117°, and made her beautiful run of 16 days from the line to The Heads. The Wild Pigeon, the Flying Dutchman, the Flying Fish (on two trips), the Jno. Gilpin, the Westward Ho, the White Squall, and the Comet, on several trips, and all celebrated ships, have made this month famous for quick runs.

With the view of pointing out the shortest route from 50° S. to the line, in the fair way to California, Lieut. Minor has selected from the tables already presented, the monthly mean of the best passages for each month. He has tabulated also the monthly mean longitude in which the vessels making these mean passages crossed the parallels named, including the equator.

Monthly Mean of Best Passages prior to 1854.

MONTH.	Mean of the best.	BEST LONGITUDE FOR CROSSING THE PARALLELS OF— 50° S.	40° S.	35° S.	30° S.	25° S.	0°.	From 50° S. to 0°.	From 0° to San Francisco.
								Days.	Days.
January . . .	9	80° 00′	83° 00′	87° 00′	90° 00′	92° 00′	111° 00′	22½	21
February . .	8	81 00	85 00	88 00	90 00	93 00	111 00	25	20
March . . .	13	82 00	85 00	88 00	89 00	93 00	110 00	25	24
April . . .	9	83 00	87 00	86 00	89 00	92 00	109 00	24½	30
May	12	82 00	85 00	87 00	87 00	90 00	109 00	24¾	30¼
June	11	82 00	84 00	86 00	89 00	91 00	110 00	27	28
July	6	82 00	88 00	90 00	92 00	95 00	115 00	23	28
August . . .	8	84 00	86 00	85 00	87 00	90 00	108 00	25	31
September . .	4	82 00	86 00	87 00	87 00	90 00	111 00	21	24
October . . .	12	80 00	82 00	84 00	86 00	89 00	110 00	24	23
November . .	11	83 00	85 00	84 00	84 00	88 00	108 00	24	23
December . .	10	83 00	83 00	84 00	87 00	91 00	113 00	22	21

Supposing that this table affords data sufficient for a fair average—but it does not—it would appear that in January, February, March, and April, decidedly the best place for crossing the line is between 115° and 120° W. That the quickest runs for each of the first three months were made by crossing between 110° and 115°. Also, in May and September, the quickest runs were made by these same crossings, and that the quickest passages in April, August and October, were made by crossing between 115° and 120°.

But a careful examination of the tables will show that according to the data before us the best average crossing-place of the line, in winter and spring, is west of 115°; that in May, the best crossing-place begins to fall east of this meridian, and to approach that of 110° more and more until August, when it is, say, 108°. It now commences to go west again, being good anywhere between 110° and 120°, or even 125°, until winter, when it settles down east of 115° again. Indeed it is a question for further inquiry and more numerous abstract logs to decide whether the passages to San Francisco from the line will not give a better average when the crossings are made west of 130° W. than they will when made east of 120° W. So that in perfecting the route to California, the turning point may be found to be masked in a problem of this sort: How much time may a vessel lose in making westing between 50° S. and the line, and yet be able to make up for this loss by making a quicker run thence to the "Heads?"

"We crossed the equator," says Mr. Freeling, of the Heloise, "on the passage from Australia to California, 23d January, 1855, in 168° W., and made the run to San Francisco in 23 days, while the clipper ship Sweepstakes crossed it January 19, in, I presume, from 112° to 120°, and only arrived 21st February, being 33 days."

This table appears to indicate that a more westerly crossing than that usually made would shorten the passage certainly from the line to San Francisco, for it shows that the mean crossings on the best trips are for the most part west of the usual route pursued by vessels generally. The mean crossings on the shortest trips are west of the average crossings for each month, except for May, October, and November. In the last two, the average crossings of the whole and of the best, are nearly coincident; and so they are from 50° south to the trade-winds, in May, when the best route seems to trend a little more to the eastward. From April to August inclusive, appear to be the most difficult months for quick passages.

This table is well calculated to impress upon the attention of navigators the propriety of the injunction, which, in the present and former editions of this work, I have endeavored, with oft-repeated emphasis, to impress upon them: *As you double Cape Horn, and get on the Pacific side, make as much westing with your northing as you can, aiming to cross the parallel of* 50° *south, as far at least as* 85° or 90° *west.* Do not beat nor dally with *baffling winds* to do this, for you want to lose no time in getting to the north.

With the view, however, of showing the best crossings of the line, I have divided it into lengths or crossings of 5° of longitude, beginning with the meridian of 95° W.; and, with the assistance of Lieut. Minor, Passed Midshipman A. A. Semmes, and O. C. Badger, am enabled to present the following tables, which show the monthly crossing of each division; the time from the United States to this equatorial place of crossing; the time thence to San Francisco, and the total length of passage from the United States:—

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific; the Time and Place of crossing the Equator, with the Passage thence to California, for each Month.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	From the line to California.	From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
Virginia	Cardiff		Dec. 21, 1852	99° 59′W.	43		43	
Whiton	New York	107	March 13, 1847	93 15	42	107	42	149
North Carolina . .	"	135	April 15, 1854	95 00	42	135	42	187
Ocean Bird . . .	"	140	May 24, 1849	99 25	38	140	38	178
Stag Hound . . .	"	91	June 1, 1852	99 20	34	91	34	125
Louisa Bliss . . .	Beaufort, N. C.	153	8, 1850	100 00	52	153	52	205
Horsburgh	New York	96	29, 1852	98 30	33	113	40	153
Chatham	Boston	130	Sept. 22, 1849	99 15	39	130	39	169
CROSSINGS BETWEEN 100° AND 105° W. LONG.								
Adelaide	New York	144	Feb. 5, 1853	104 06	34	112	29	141
Golden Gate . . .	"	80	24, 1853	104 37	24			
Europe	"	114	March 17, 1852	100 00	35	112.5	28	140.5
George Brown . .	Philadelphia	111	14, 1851	104 45	22			
John Holland . . .	New York	134	April 16, 1853	102 28	24	122	27	149
Great Britain . . .	"	110	28, 1852	104 30	30			
Sea Serpent . . .	"	82	May 5, 1853	102 03	26	82	30	112
Anonyma	Boston		23, 1849	102 40	34			
Sea Serpent . . .	New York	88	June 5, 1852	101 12	25	108.7	36	144.4
Governor Morton .	"	91	12, 1852	101 43	32			
Sweden	Boston	117	26, 1849	102 20	38			
Michael Angelo . .	New York	113	27, 1852	102 09	36			
Hampton	"	130	29, 1853	102 25	39			
C. L. Bevan . . .	Philadelphia	113	2, 1853	103 00	46			
Thomas B. Wales .	Boston	100	July 3, 1852	102 51	33	100	32	132
White Squall . . .	New York	84	3, 1852	100 26	26			
Empire	"	97	8, 1852	102 01	35			
R. C. Winthrop . .	Boston	108	12, 1852	104 07	33			
North America . .	New York	112	27, 1852	100 27	34			
Messenger	"	88	Aug. 29, 1852	102 32	34	89.5	31	120
Union	"	91	31, 1852	101 10	28			
Carioca	Philadelphia	116	Sept. 6, 1852	100 56	41	117.5	40.5	157.5
Copeland	Boston	119	7, 1852	103 43	40			
Cohota	"	110	Oct. 5, 1852	104 09	26	108	29	137
Albany	New York	127	6, 1852	101 34	38			
Sea Witch	"	87	27, 1851	101 30	23			
Raven	"	93	Nov. 2, 1852	104 32	29	95	25.5	120.5
Samuel Russell . .	"	97	17, 1852	101 30	22			
Monsoon	Boston	100	Dec. 6, 1852	103 53	26	100	26	126
CROSSINGS BETWEEN 105° AND 110° W. LONG.								
Revere	New York	111	Jan. 3, 1852	109 30	26	102.3	23	125.5
Wild Pigeon . . .	"	88	10, 1852	108 59	17			
Golden Gate . . .	"	90	12, 1852	106 00	23			
Manchester	"	139	5, 1853	107 00	26			
Ringleader	Boston	85	15, 1853	110 00	25			
Eureka	New York	102	15, 1853	110 00	21			

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific, &c.—Continued.

CROSSINGS BETWEEN 105° AND 110° W. LONG.—Continued.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	From the line to California.	From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
John Jay	New Bedford	133	Feb. 6, 1850	105° 10′W.	37			
Gray Feather	New York	100	17, 1852	109 27	26			
Tingqua	"	87	19, 1852	106 25	28			
Hazard	"	107	21, 1851	109 30	24	111	29	140
Helena	"	113	19, 1851	110 00	21			
Russell	"	128	7, 1850	110 00	37			
F. W. Brune	"	122	March 2, 1853	106 56	29			
Winged Racer	"	85	7, 1853	106 24	23			
John Bertram	Boston	86	8, 1853	109 47	19			
Cygnet	"	125	8, 1853	109 00	30			
Sartelle	New York	135	29, 1850	107 15	34			
Whiton	"	112	15, 1848	109 05	28	108	26	130
Samuel Appleton	"	103	23,	109 30	18			
Golden West	Boston	101	24, 1853	107 04	23			
Uriel	"	86	30, 1851	109 45	34			
Benjamin Howard*	"	95	29, 1852	110 00	25			
Telegraph	"	91	23, 1854	106 00	24			
Sch'r Walter (*via* Rio)	New York	121	April 10, 1853	108 33	25			
Wisconsin	"	94	22, 1852	106 00	30			
Hermann	Philadelphia	155	11, 1850	108 00	37	113	27	143
Game Cock	New York	94	5, 1854	109 00	16			
Gray Feather	"	108	May 1, 1851	109 45	28			
Star of the Union	"	97	5, 1853	106 38	27			
Golden Racer	Boston	96	6, 1853	108 45	34			
Simoom	New York	107	6, 1853	106 41	26	104	30.6	134.8
Governor Morton	"	97	15, 1853	109 01	26			
Tornado	"	84	17, 1852	107 07	44			
Aurora	Nantucket	140	30, 1849	110 00	31			
Polynesian	Philadelphia	105	18, 1854	110 00	29			
Kate Hays	New York	122	June 3, 1852	109 16	31			
New York	"	103	3, 1853	107 30	35			
Herculean	"	119	8, 1853	109 21	35			
H. Birckhead	Baltimore	111	17, 1853	109 00	31			
Lantao	New York	94	23, 1853	105 55	30			
Vandalia	"	126	2, 1850	107 30	36			
Masconoma	"	123	4, 1850	108 00	45	123	39.4	147
Sherwood	Boston	106	25, 1851	108 45	40			
Climax	"	88	24, 1853	106 30	27			
Ino	New York	99	19, 1851	109 30	34			
Adirondack†	"	151	12, 1850	109 40	49			
Home	Baltimore	109	10, 1850	110 00	39			
Roscoe	New York	121	27, 1853	109 45	27			
Cynthia	New Orleans	128	8, 1854	110 00	53			

* CAPT. SHRIEVE to LIEUT. MAURY: "I approve of the route laid down by you. I have had much experience at sea, as shipmaster, in all quarters of the globe, and heartily concur in your views respecting passages. I also believe the day is not far distant when passages to California will be made frequently in one hundred days. I have often been amazed in viewing tracks of different ships to this port, and those who have the longest passages have been broad off the *right track*. The Benjamin Howard is a medium clipper, seven hundred tons. You will notice I have beat the whole fleet that sailed about the time I did; experienced all sorts of weather on the passage; neither tore a sail nor lost a spar the whole passage."

† Not included in the average.

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific, &c.—Continued.

CROSSINGS BETWEEN 105° AND 110° W. LONG.—Continued.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	From the line to California.	From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
Gazelle	New York		July 9, 1849	105° 30′W.	30			
Edgar	"	126	2, 1850	108 15	39			
Staffordshire	Boston	83	24, 1852	108 01	18	108	33.5	132
Cohota	"	103	19, 1850	109 45	23			
Storm King	"	111	3, 1853	106 30	24			
Ellen Noyes	"	111	Aug. 6, 1852	107 30	33			
Flying Cloud	New York	95	17, 1852	105 20	19	100.6	24.7	127
White Squall	Philadelphia	96	13, 1853	110 00	22			
Mermaid			Sept. 21, 1851	105 45	27			
Eliza Mallory	New York	115	10, 1852	108 42	37	128	30	158
Eureka	"	141	15, 1851	108 20	25			
Butler								
Telegraph	"	102	Oct. 22,	109 30	23			
Horsburgh	"	128	7, 1853	109 00	34	112	27	139
Whistler	Boston	107	31, 1853	109 00	24			
Seaman	New York	102	Nov. 13, 1852	109 41	26			
Boston	Rio de Janeiro	81	27, 1849	106 00	40	108	28	138
Kate Hays	Philadelphia	156	6, 1853	110 00	21			
Raven	New York	94	16, 1853	109 00	25			
Horton	"	151	Dec. 23, 1850	109 15	33	151	33	184

CROSSINGS BETWEEN 110° AND 115° W. LONG.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	To the line from U. S.	From the line to California.	From the U. S. to California.
Wild Pigeon	New York	104	Jan. 14, 1853	112 20	24			
Flying-Fish	"	74	13, 1853	112 00	18			
Anstiss	Richmond, Va.	116	22, 1853	110 00	25			
Sword-Fish	New York	71	21, 1852	110 15	20			
Ambassador	"	127	16, 1849	112 35	32			
Celestial	"	84	23, 1852	113 30	23			
George Raymond	Boston	102	23, 1852	114 34	25			
Golden City	New York	87	18, 1854	114 00	20			
Ann Maria	"	131	20, 1854	110 00	23	103	23.5	126.7
Sam'l Lawrence	Boston	99	26, 1854	111 00	25			
Eagle	New York	85	28, 1854	112 00	19			
N. B. Palmer	"	96	1, 1854	112 00	26			
Onward	"	130	4, 1854	113 00	21			
Bald Eagle	"	93	4, 1854	113 00	21			
Parthenon	Boston	117	8, 1854	113 00	31			
Franconian	"	123	20, 1854	113 00	26			
Morning Light	Philadelphia	113	17, 1854	113 00	23			
Trade-Wind	New York	85	Feb. 7, 1853	112 20	16			
Capitol	Richmond, Va.	112	7, 1853	113 00	20			
Realm	New York	138	8, 1853	113 35	35			
Contest	"	84	9, 1853	111 06	16			
Telegraph	Boston	96	18, 1853	112 00	20	99	24	133.4
Cygnet	New York	118	26, 1850	111 15	29			
Lawrence	"	134	28, 1850	113 45	26			
Alboni	"	99	28, 1853	113 44	28			
Cyclone	Boston	93	5, 1854	115 00	20			
Arthur	New York	135	9, 1854	112 00	30			

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific, &c.—Continued.

CROSSINGS BETWEEN 110° AND 115° W. LONG.—Continued.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	AVERAGE PASSAGE. From the line to California.	AVERAGE PASSAGE. From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
Surprise	New York	80	March 3, 1851	110° 30′W.	17			
Winthrop	Boston	116	3, 1851	110 30	29			
Potomac	Portland	133	3, 1851	111 20	32			
Living Age . . .	New York	108	12, 1853	112 25	20			
Storm	"	87	17, 1853	110 32	23			
Anna Kimball . .	"	110	22, 1853	114 10	22			
Bald Eagle	"	88	23, 1853	111 15	19	107.8	25	132.9
Danube	"	130	23, 1853	110 32	26			
Bothnia	"	123	24, 1851	112 15	25			
Kentucky	Boston	122	26, 1853	113 08	25			
Hannibal	"	120	22, 1850	114 45	40			
Roman	New York	103	23, 1853	110 32	25			
Eagle Wing . . .	Boston	82	12, 1854	113 00	23			
Phantom	"	90	April 6, 1853	113 32	14			
John Steward . . .	New York	111	11, 1853	112 34	32			
Russell Glover . .	"	115	14, 1850	113 00	21			
Celestial	"	98	16, 1853	110 06	22			
Rattler	"	98	16, 1853	114 08	23			
Daniel			28, 1851	113 15	33			
Alhesdrough . . .	"	104	26, 1853	113 36	32	100.6	25.6	125.6
Aldebaran	Boston	123	27, 1852	110 05	35			
Sea Serpent . . .			22, 1851	114 15	25			
Esther May . . .	"	112	28, 1853	113 00	33			
Flying Cloud . . .	New York	74	6, 1854	110 00	15			
Archer	"	84	7, 1854	112 22	22			
Huguenot	"	98	19, 1853	113 00	26			
Susquehanna . . .	Philadelphia	108	May 1, 1851	113 25	29			
F. Depau	New York	139	20, 1850	112 45	27			
Stag Hound . . .	"	93	4, 1851	113 30	21	110	28.5	138.6
Masconoma . . .	Boston	122	7, 1853	110 07	37			
Sword Fish . . .	New York	84	7, 1853	114 02	24			
M. Howes	Boston	115	8, 1854	114 00	33			
Surprise	New York	87	June 8, 1853	110 43	30			
Paragon	"	120	8, 1853	113 25	41			
Archibald Gracie .	Boston	111	11, 1850	111 00	36			
Sirocco	New York	117	12, 1853	111 30	28			
Delia	"	128	10, 1851	114 00	34			
Morgan Dix . . .	"	107	13, 1853	110 30	36			
Tigress	Salem	132	1, 1850	114 30	33			
Seaman's Bride . .	New York	92	19, 1853	114 55	29	106	32.8	139.5
Rose Standish . . .	"	111	20, 1850	113 00	45			
Competitor	Boston	89	24, 1853	114 00	25			
Parthian	Richmond, Va.	94	25, 1853	111 20	28			
Emily Minor (*via* Juan Fernandez)* . .	New York	170	27, 1853	113 55	32			
R. B. Forbes . . .	"		25, 1854	114 00	31			
Santiago	"	104	26, 1853	113 00	32			
Surprise	"	85	30, 1854	112 00	32			

* Not included in the average.

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific, &c.—Continued.

CROSSINGS BETWEEN 110° AND 115° W. LONG.—Continued.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	AVERAGE PASSAGE. From the line to California.	AVERAGE PASSAGE. From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
Flying Eagle (*via* Rio)	Boston	109	July 7, 1853	114° 40′W.	34			
Hornet	New York	87	23, 1853	112 54	20			
John Land	Boston	94	25, 1853	114 47	31			
Venice	New York	107	14, 1850	114 45	30	109	31	140
Abbot	Bordeaux	126	23, 1852	113 15	38			
Amity	Boston	132	15, 1850	115 00	31			
St. Patrick	New York	118	Aug. 14, 1850	110 45	34			
Isaac Allerton . . .			13, 1850	111 15	34			
Caroline	"	127	11, 1850	113 30	36			
Sarah and Eliza* . .	"	180	12, 1849	113 40	36			
N. B. Palmer . . .	"	88	2, 1851	114 00	19	108	30.7	141
Victory	"	103	2, 1853	112 45	32			
Witch of the Wave .	Boston	89	18, 1851	115 00	32			
Jas. H. Shepherd* .	New York		1, 1853	114 00	43			
Atalanta	"	122	28, 1853	115 00	40			
Avondale	Baltimore	119	30, 1853	112 00	29			
N. B. Palmer . . .	New York	101	Sept. 6, 1852	113 49	24			
Templeton	Bucksport	126	10, 1850	112 30	27			
Southerner* . . .	New York	141	16, 1852	112 10	33			
Lady Arabella . .	"	138	4, 1850	113 00	33			
Virginia			2, 1850	114 00	33			
Witch of the Wave	Boston	90	21, 1852	113 50	25			
Belle of the West .	"	104	5, 1853	112 00	24	112.6	29.4	140.9
Rubicon	New York	135	12, 1853	114 00	32			
E. C. Sronton* . .	"	141	17, 1853	112 00	39			
Harrisburg	"	123	20, 1853	112 00	39			
West Wind . . .	Boston	99	24, 1853	112 00	34			
Reindeer	New York	123	17, 1854	113 00	38			
Golden State . . .	"	99	4, 1854	112 00	24			
John Bertram . . .	Boston	91	29, 1853	114 00	24			
Thomas Perkins . .	New York	100	Oct. 25, 1849	110 45	26			
Columbia	Boston	133	12, 1850	111 45	35			
Jamestown	New York	103	20, 1852		25			
Raven	Boston	85	29, 1851	112 00	20			
Typhoon	New York	87	30, 1851	114 41	19			
Eagle	"	101	20, 1851	115 00	28	108.9	26.2	135.1
Carrington	"	103	5, 1850	115 00	26			
Celestial	"	83	11, 1850	115 00	21			
Sandusky	"	137	5, 1853	114 00	34			
Wild Duck	"	108	21, 1853	115 00	24			
Hero	"	127	27, 1853	114 00	29			
Winfield Scott . .	"	140	29, 1853	115 00	28			
Talbot	"	139	Nov. 12, 1850	115 00	31			
Valparaiso	"	138	2, 1851	115 00	30			
Winged Arrow . .	Boston	95	4, 1852	114 39	22			
Sea Witch	New York	91	22, 1852	114 10	17			
Kate Hays	Philadelphia	131	6, 1853	110 00	21			
Sunbeam	Boston	138	3, 1853	115 00	24			
Witch of the Wave	"	91	14, 1853	115 00	26	113.6	24	137.6
Trade-Wind . . .	Philadelphia	91	16, 1853	115 00	24			

* Not included in the average.

The Names of Vessels; their Passages from Atlantic Ports to the Line in the Pacific, &c.—Continued.

CROSSINGS BETWEEN 110° AND 115° W. LONG.—Continued.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	AVERAGE PASSAGE. From the line to California.	AVERAGE PASSAGE. From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
Mandarin	New York	101	Nov. 19, 1853	112° 00′W.	22			
Hurricane	"	102	18, 1853	114 00	22			
North Wind . . .	"	116	21, 1853	115 00	22			
Arab*	Boston	140	24, 1853	114 00	42			
Wisconsin	New York	131	24, 1853	112 00	27			
John Wade . . .	"	94	Dec. 15, 1852	110 30	23			
Thos. W. Sears . .	"	124	21, 1852	112 59	21			
Senator	"	105	26, 1852	111 00	30	102	23.2	125.2
Unknown	Boston	91	19, 1853	113 00	21			
Skylark	New York	96	25, 1853	114 00	21			

CROSSINGS BETWEEN 115° AND 120° W. LONG.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	To the line from U. S.	From the line to California.	From the U. S. to California.
John Gilpin . . .	New York	78	Jan. 15, 1853	116 00	16			
Flying Fish . . .	Boston	77	22, 1852	119 50	23	81	19.3	100.2
Westward-Ho . . .	New York	88	12, 1853	120 00	19			
Seaman	"	89	Feb. 20, 1850	118 00	18	89	18	107
Flying Childers . .	Boston	91	March 19, 1853	117 21	22			
Newton	"	124	10, 1851	117 10	26			
Lucia Field . . .	"	120	19, 1851	119 15	31			
Lantao	New York	103	21, 1851	118 00	20	116	26	142
Canton	"	136	28, 1849	118 00	29			
Southerner	"	120	30, 1851	117 00	28			
Eagle	"	92	April 9, 1853	115 30	21			
Tornado	"	79	10, 1853	118 10	22			
Amelia	"	111	29, 1853	116 41	23			
Isabelita Hyne . .	"	101	23, 1851	116 00	24	97.3	23.1	119
Maria	"	111	16, 1851	117 00	32			
Samuel Russell . .	"	90	15, 1850	118 30	20			
Herald of the Morning	Boston	86	16, 1854	119 00	20			
Lucknow	Boston	111	May 6, 1853	117 50	27			
Astrea	New York	138	20, 1853	115 49	35			
Diadem	"		22, 1850	116 00	36			
Arcole	Philadelphia	105	31, 1850	117 00	30	111	28.7	138.6
Wisconsin	New York	100	31, 1850	118 45	24			
Valparaiso	"	114	31, 1850	119 00	28			
Seaman's Bride . .	"	99	2, 1854	117 00	21			
Stag Hound . . .	"	95	June 5, 1853	116 03	26			
Archer	"	108	8, 1853	115 08	37			
Houqua	"	120	21, 1853	115 11	24			
Empress of the Seas	"	89	10, 1853	115 30	32	112	32	144
St. Lawrence . . .	"	141	29, 1853	116 15	37			
Robert Harding . .	Boston	126	28, 1853	116 36	39			
Houqua	New York	103	25, 1850	115 15	28			
Sarah Boyd . . .	Philadelphia	129	July 15, 1850	115 15	32			
Raduga	New York	116	28, 1851	118 00	25			
Sheridan	"	103	2, 1850	118 30	28	114.4	29.2	143
Hermann	"	110	30, 1849	120 00	27			
Eliza Thornton* . .	New Bedford	145	9, 1853	116 53	42			
Benj. Howard . .	New York	114	6, 1853	120 00	34			

* Not included in the average.

The Names of Vessels; their Passage from Atlantic Ports to the Line in the Pacific, &c.—Continued.

CROSSINGS BETWEEN 115° AND 120° W. LONG.—Continued.

NAME OF VESSEL.	Port last from.	To the equator in the Pacific.	Date of crossing the equator in the Pacific.	Longitude of crossing the equator.	From the equator to San Francisco.	AVERAGE PASSAGE. To the line from U. S.	From the line to California.	From the U. S. to California.
		Days.			Days.	Days.	Days.	Days.
Finland*	Philadelphia	133	Aug. 6, 1850	117° 15′W.	42			
Channing	New York	124	9, 1853	115 25	35			
Oxnard	"	116	8, 1853	115 40	34			
Levanter	"	125	26, 1853	117 30	32	119	37.4	150.6
Linwood	Baltimore	116	9, 1853	117 00	26			
Mary Annah* . . .	New York	137	9, 1853	116 00	38			
Highflyer			4, 1853	117 00	29			
Celestial Empire . .	New York	114	21, 1853	117 00	31			
Flying Dutchman .	"	78	Sept. 8, 1853	119 00	28			
Young America . .	"	88	7, 1853	116 00	22	100.7	27.2	128
Cyane	H. Roads	109	12, 1853	116 00	32			
Greenwich	Boston	128	16, 1853	116 00	27			
Gertrude	New York	116	Oct. 8, 1850	116 00	30			
Sovereign of the Seas	"	83	27, 1852	119 47	20	101.3	26.3	127.6
Windward	"	105	4, 1853	116 00	29			
F. P. Sage* . . .	"	142	18, 1853	116 00	34			
Comet	"	102	Nov. 15, 1853	116 00	25			
John Wade . . .	Boston	95	27, 1853	117 00	24	98	24.5	123
Wizard* (from Rio) .	New York		27, 1853	116 00	22			
Comet	"	88	Dec. 28, 1851	117 00	16			
Winged Arrow . .	Boston	108	27, 1853	118 00	18	94	18	112
Sam'l Russell . . .	New York	86	31, 1853	117 00	20			

CROSSINGS BETWEEN 120° AND 125° W. LONG.

Westward-Ho . . .	Boston	89	Jan. 13, 1853	122 06	18	89	18	107
Acasta	Sag Harbor	171	March 10, 1851	120 30	28	171	28	199
Kensington . . .	New York	129	June 24, 1851	122 45	39	129	39	168
Tartar	Philadelphia	104	July 24, 1851	121 30	30	103.5	30.5	134
Uncle Toby . . .	Boston	103	31, 1853	121 15	31			
Flying Cloud . . .	New York	71	Aug. 12, 1851	124 00	19			
Cleopatra	Boston	103	3, 1853	122 00	27	97.3	29.6	126.6
Amazon	New York	118	4, 1853	121 00	42			
Anglo-Saxon . . .	"	127	Sept. 18, 1853	121 00	23	127	23	150

CROSSING WEST OF 125° W. LONG.

Tagus	New York	126	June 15, 1851	128 00	46	126	46	172

* Not included in the average.

Average Length of best Passages of California-bound Vessels from the Atlantic Ports of the U. S. to the Equator in the Pacific, and from the Equator in the Pacific to San Francisco—arranged according to the Month and the Longitude of crossing the Equator.

Month of crossing the equator in the Pacific.	From U. S. to the equator in the Pacific.	No. of passages from which averages are determined.	Averages from the equator to California.	No. of passages from which averages are determined.	Place of crossing the equator in the Pacific.	Average from U. S. to California.	Average passage of the whole month from U. S.	Shortest passage from the U. S. for the month.
	Days.		Days.		Between	Days.	Days.	By the
January . . .	103	6	25	6	105—110	125		
	103	17	23	17	110—115*	126		*Sword-Fish, 91 days.
	88	3	19	3	115—120	100	122	
	89	1	18	1	120—125	107		
February . .	112	2	29	2	100—105	141		
	111	6	29	6	105—110	140		
	99	10	24	10	110—115*	133	134	*Contest, 100 days.
	89	1	18	1	115—120	107		
March . . .	107	1	42	1	90— 95	149		
	112	2	28	2	100—105	140		
	108	11	26	11	105—110	130		
	107	13	25	13	110—115*	132	134	*Surprise, 97 days.
	115	6	26	6	115—120	141		
	171	1	28	1	120—125	199		
April	135	1	42	1	95—100	187		
	122	2	27	3	100—105	149		
	113	4	27	4	105—110	143		
	100	13	25	13	110—115*	125	128	*Flying Cloud, 89 days.
	97	7	23	7	115—120	119		
May	140	1	38	1	95—100	178		
	82	1	30	2	100—105*	112		*Sea Serpent, 108 days; and the
	104	8	30	8	105—110	134	135	
	110	6	28	6	110—115*	138		*Sword-Fish, 108 d'ys.
	111	7	28	7	115—120	138		
June	113	3	40	3	95—100	153		
	108	6	36	6	100—105*	144		*Sea Serpent, 113 days.
	123	14	39	14	105—110	147	144	
	106	14	32	14	110—115	139		
	112	7	32	7	115—120	144		
	129	1	39	1	120—125	168		
July	100	5	32	5	100—105	132		
	108	5	33	5	105—110*	132		*Staffordshire, 101 days.
	109	6	31	6	110—115	140	137	
	114	5	29	5	115—120	143		
	103	2	30	2	120—125	134		
August . . .	89	2	31	2	100—105	120		
	100	3	25	3	105—110	127		
	108	8	30	8	110—115	141	138	
	119	7	37	7	115—120	150		
	97	3	29	3	120—125*	126		*Flying Cloud, 90 days.
September . .	130	1	39	1	95—100	169		
	117	2	40	2	100—105	157		
	128	3	30	3	105—110	158		
	112	11	29	11	110—115	140	141	
	100	4	27	4	115—120*	127		*Flying Dutchman, 106 days.
	127	1	23	1	120—125	150		
October . . .	108	3	29	3	100—155	137		
	112	3	27	3	105—110	139	134	
	108	12	26	12	110—115	135		*Sovereign of the Seas, 103 days.
	101	4	26	4	115—120*	127		

Average Length of best Passages of California-bound Vessels, etc.—Continued.

Month of crossing the equator in the Pacific.	From U. S. to the equator in the Pacific.	No. of passages from which averages are determined.	Averages from the equator to California.	No. of passages from which averages are determined.	Place of crossing the equator in the Pacific.	Average from U. S. to California.	Average passage of the whole month from U. S.	Shortest passage from the U. S. for the month.
	Days.		Days.		Between	Days.	Days.	By the
November . .	95	2	25	2	100—105	120		
	108	4	28	4	105—110	138	134	
	113	12	24	12	110—115*	137		*Sea Witch, 108 days.
	98	2	24	2	115—120	123		
December . .	100	1	26	1	100—105	126		
	102	5	23	5	110—115	125	120	
	94	3	18	3	115—120*	112		*Comet, 104 days.

Let us see what light the information, contained in these two tables, will throw upon the best California route, as well as upon the best season of the year for that voyage.

The shortest monthly mean is 120 days, and that is for the vessels that crossed the equator in the Pacific, during the month of December. And to this crossing they had an average run of 99 days. Vessels that sail from the United States to California, in all of September and October, are the vessels which, upon an average, should have the fairest winds and make the best passages.

The crossings that have given the shortest passage to San Francisco for each month are marked (p. 682) with an asterisk (*), and the name of the vessel quoted in the last column.

It is of some consequence, in deciding as to the best crossing-place on the equator, that the navigator should have an idea as to the parallels near which he may expect to lose the S. E. trades; for the equatorial limits of these winds change with the season.

In March, you will occasionally carry them several degrees over into the northern hemisphere. But in this month they are generally near the verge of their extreme declination towards the south. When you lose them and get the N. E. trades, keep away with a good rap full, never aiming to cross the parallel of 20° north to the east of long. 125° west. Unless the winds force you off, aim to be in shore of the meridian of 130° W. when you lose the N. E. trades.

When you do lose them, if then you have to fight the calms and baffling winds of the horse latitudes, make the best of your way on a due north course, till you cross this belt of calms, or catch a good wind, or get into the variables beyond. I shall have more to say upon this subject at some other time.

In April, you will carry these trades for a little farther, and so on farther and farther until October, when the northern edge of them becomes stationary and commences to return south. It reaches its farthest parallel of southern declination in March or April.

It may be well here to make a general remark as to the influence of extensive arid plains which the navigator may find to the east of him as he sails, *in any part of the ocean*, across the belt of the N. E. or S. E. trade-winds.

In the summer and fall, the influence of these winds is felt far out to sea. The monsoons of India

are due to such an influence; so are the monsoons in the Atlantic; in the Gulf of Mexico; and in the Pacific off the coasts of Central America; and so, indeed, are all monsoons produced.

Why, then, not have a monsoon in the southeast trades of the Pacific, since South America and the pampas of Buenos Ayres are to windward of them?

In the first place, the Andes stand up as a screen between them and those plains; and in the next place, those plains are neither so very extensive nor so arid when we come to compare them with the vast deserts of Africa and Asia.

But, nevertheless, in order to keep away from the land, and clear of its influence, though feeble upon the winds of the South Pacific, navigators should, when winds are fair and opportunities favorable, endeavor to make, while they are well to the south, westing enough to keep clear even of the slight influence that the land in South America exerts upon the winds along its west coast.

Therefore, after you have doubled Cape Horn, and gained an offing from the land, there is no necessity for running a thousand miles or more off from the South American coast, as from the coasts of Central America you have to do, in order to get better winds. The chief advantage of making, while south of the parallel of 35° or 40° S., the meridian near which you intend to cross the equator, is, that there the degrees of longitude are short, and therefore easy to run down; and that when you have made your westing down there, you can spread the more canvas when you get the S. E. trades, which you will then have on the quarter. If you put off making westing until you get these winds, you will then have to stand away to the northward and westward through them, which course will bring them aft, and therefore make them less favorable.

The Flying Cloud's track beautifully illustrates this view. On her celebrated passage, she passed along the west of South America, in the southern winter time, when the influence of the land there upon the winds is the least. She crossed the line in August, in 124°, far beyond the influence of the disturbing agents in North America.

This passage, however, of the Flying Cloud should be alluded to, not as a rule, but rather as an exception. Nevertheless, she does not so out-top all hope of reasonable expectations, that other ships may not strive to surpass her. For, though she has set a good example, that example will yet be more than followed.

It appears from the summing up, that the average passage to California, for all classes of ships that use the Charts, is, the year round, 133* days. When these investigations commenced, the average passage the year round, of all classes of ships from the Atlantic ports of the United States to California, was 180 days.

For that part of the route between New York and the line in the Atlantic, the average time saved is ten days to each ship; for the average passage to the equator in the Atlantic, was, by the old route, 41 days; it is *now*, by the new, 31.

The following table may be interesting. It gives the crossing-places of the line in the Pacific, and the time from the United States, with the names of many of the vessels by which the shortest passage in each month was made.

* Being a gain of three days within the last year.

Name of Ship and Place of crossing the Equator in the Pacific on the Shortest Passages for each Month.

NAME OF VESSEL.	To line in Pacific.	Place of crossing.	Line to California.	Total from U. S. to California.	Crossed the line in the month of
	Days.		Days.	Days.	
Flying Fish	74	112° 00′ W.	18	92	January.
John Gilpin	78	116 00	16	94	"
Flying Fish	77	120 00	23	100	"
Sword-Fish	71	110 00	20	91	"
Celestial	84	113 00	23	107	"
Wild Pigeon	88	109 00	17	105	"
Golden Gate	90	106 00	23	113	"
Westward-Ho	89	122 00	18	107	"
Ringleader	85	110 00	25	110	"
Eagle	85	112 00	19	104	"
Contest	84	111 00	16	100	February.
Trade-Wind	85	112 00	16	101	"
Seaman	89	118 00	18	107	"
Hazard	107	109 00	24	133	"
Helena	113	110 00	18	131	"
Cyclone	93	115 00	20	113	"
Bald Eagle	88	111 00	19	107	March.
Storm	87	110 00	23	110	"
Flying Childers	91	117 00	22	113	"
Surprise	80	110 00	17	97	"
Samuel Appleton	103	110 00	18	121	"
Telegraph	91	106 00	24	115	"
Eagle Wing	82	113 00	23	105	"
Tornado	79	118 00	22	101	April.
Eagle	92	115 00	21	113	"
Phantom	90	113 00	14	104	"
Celestial	98	110 00	22	120	"
Samuel Russell	90	118 00	20	110	"
Russell Glover	115	113 00	21	136	"
Game Cock	94	109 00	16	110	"
Flying Cloud	74⅓	110 00	15	89⅓	"
Archer	84	112 00	22	106	"
Herald of the Morning	86	119 00	20	106	"
Sword-Fish	84	114 00	24	108	May.
Stag Hound	93	114 00	21	114	"
Stag Hound	90	96 00	34	124	"
Tornado	84	107 00	44	128	"
Stag Hound	95	116 00	26	121	June.
Surprise	87	111 00	30	117	"
Competitor	89	114 00	25	114	"
Empress of the Seas	89	115 00	32	121	"
Seaman's Bride	92	115 00	29	121	"
Sea Serpent	88	101 00	25	113	"
Governor Morton	91	102 00	32	123	"
Surprise	85	112 00	32	117	"
Hornet	87	113 00	20	107	July.
John Land	94	115 00	31	125	"
Staffordshire	83	108 00	18	101	"
Cohota	103	110 00	23	126	"
Empire	97	102 00	35	132	"
Thomas B. Wales	100	103 00	33	133	"
Flying Cloud	71	124 00	19	90	August.
N. B. Palmer	88	114 00	19	107	"
Union	91	101 00	28	119	"

Name of Ship and Place of crossing the Equator in the Pacific on the Shortest Passages each Month—Continued.

NAME OF VESSEL.	To line in Pacific.	Place of crossing.	Line to California.	Total from U. S. to California.	Crossed the line in the month of
	Days.		Days.	Days.	
White Squall	96	110° 00′ W.	22	118	August.
Cleopatra	103	122 00	27	130	"
N. B. Palmer	101	114 00	24	125	September.
Witch of the Wave	90	114 00	25	115	"
Templeton	123	112 00	27	150	"
Belle of the West	104	112 00	24	128	"
Golden State	99	112 00	24	123	"
John Bertram	91	114 00	24	115	"
Flying Dutchman	78	119 00	28	105	"
Young America	88	116 00	22	110	"
Jamestown	103		25	128	October.
Sovereign of the Seas	83	120 00	20	103	"
Raven	85	112 00	20	105	"
Celestial	83	115 00	21	104	"
Typhoon	87	115 00	19	106	"
Sea Witch	91	114 00	17	108	November.
Winged Arrow	95	115 00	22	.117	"
Raven	93	105 00	29	122	"
Raven	94	109 00	25	119	"
Witch of the Wave	91	115 00	26	117	"
Trade-Wind	91	115 00	24	115	"
John Wade	95	117 00	24	119	"
John Wade	94	111 00	23	117	December.
Comet	88	117 00	16	104	"
White Squall	From Rio	124 00	14		"
Unknown	91	113 00	21	112	"
Skylark	96	114 00	21	117	"
Samuel Russell	86	117 00	20	106	"
Winged Arrow	108	118 00	18	126	"

In urging upon California-bound vessels the importance of making westing about the parallel of 50° S., I do not mean that they should expose themselves to heavy weather, or contend against adverse circumstances, in order to get west on this part of the route; I simply mean that, if a vessel, after doubling the cape, can steer a W. N. W. course as well as a N. W.; or a N. W. as well as a N. N. W.; or a N. N. W. as well as a N. course, that she should on all such occasions give preference to the course that has most westing in it, provided she do not cross 50° S. to the westward of 100° or thereabouts; nor 30° S. to the westward of 120°; nor enter the S. E. trade-wind region to the west of the last-named meridian. This is the western route. It is so called because it requires you to keep as far west within certain limits as you well may without running broad off to make westing, or without fighting with head winds, or baffling winds, or calms, to get west.

The western route from Cape Horn to California is to be preferred by all vessels that double the Horn from May till October inclusive. This route lies well out from the land; so that the influence of the land upon the winds will not be as marked as it is at the same season along the eastern or usual route.

The farther from the land, the more regular and steady the wind, may be safely taken as a general rule. There is much more land in the northern than in the southern hemisphere; and the action of the sun's

rays in our summer time upon this excess of the land, very materially interferes, as my researches abundantly prove, with the regular course of the N. E. trades.

Where is there such a thing known as a regular monsoon in the southern hemisphere? The monsoons of India and the China seas are due this excess of land in our hemisphere. So are the African monsoons of the Atlantic, the monsoons of the Pacific, and those of the Gulf of Mexico. They are all produced by the action of the rays of the sun upon extensive deserts, or wide and arid plains in the northern hemisphere. There may be a monsoon south about New Holland and Madagascar; but we are speaking of what we know certainly to be the case.

In the interior of North America, between the parallels of 30° and 40° N., there is an immense region of country that is parched with drought during the summer and fall; the influence of this region is, as I have before remarked, felt by the winds of the Gulf of Mexico, by the winds of the intertropical regions of the Pacific beyond Central America, and by the winds out upon the high seas, off the coast of California and Oregon; these winds, for many miles out to sea, feel that influence, obey it, and assume the character more or less of monsoons during our summer and fall.

In the discovery of this fact we have the key to the California route, from the equator up.

A vessel that crosses the equator in August or September, as far as 120° or 125° W., is some 1,500 miles from the Continent, and about 2,500 miles from the centre of this disturbing agent. Being bound from the crossing to California, she has the belt of N. E. trades to cross. These winds blow with much more regularity to the west of 120° than they do at this season in with the coast. Having, therefore, to cross them, the vessel is enabled to do it by a course, on the average, between N. N. W. and N. W. This course brings her out of them as far west, it may be, as 145°, about the latitude of San Francisco. But this is the season when N. W. and westerly winds most prevail in this part of the ocean also.

On account of the atmospherical disturbance situated in the interior of North America, as before explained, and in the latitude of San Francisco, or as high up as 40° (for that will be found occasionally not too far for a vessel on the western route to go), the degrees of longitude are not long, and with fair winds it will not take many days for her, when near the parallel of 40°, to run down 10°, or 15° of longitude.

According to all these California passages, and the results which they show, it appears that it is *possible* for a vessel under canvas to make a run from New York to San Francisco in eighty-five days. And it does not appear that there has ever been a combination of circumstances and a succession of winds which would have made it possible for any vessel to have done this more than once or twice in the last three years. If the Flying Cloud or the Sword-Fish, after crossing the line in the Pacific, had met with the winds which the White Squall had thence to San Francisco, she would have made the run in eighty-five days. Eighty-five days may be regarded, therefore, as the shortest combined passage, and as the minimum limit of *possible* passages from any one of the Atlantic ports of the United States. It is, therefore, we may infer, within the range of probability that the passage by ships, at their present rate of speed, may be made

in eighty-five days from the Eastern States to California; but it is scarcely probable, for it is barely within the range of possibility, that it will ever be made in less time.

Mean monthly average passages from 50° south to the equator, and from the equator to San Francisco, as determined by the passages prior to 1854, and given in the sixth edition of this work, compared with the mean of the passages made since the 1st January, 1854, and now given in this edition.

AVERAGE PASSAGES.

			From 50° S. to Equator.	From Equator to San Francisco.
January.	Mean of 18 vessels	prior to January, 1854, . .	27.7 days.	25.5 days.
"	" 6 "	since " " . .	24.6 "	22.8 "
February.	Mean of 25 "	prior to January, 1854, . .	28.8 "	24.4 "
"	" 3 "	since " " . .	24.0 "	24.0 "
March.	Mean of 25 "	prior to January, 1854, . .	29.6 "	26.8 "
"	" 5 "	since " " . .	25.0 "	23.0 "
April.	Mean of 18 "	prior to January, 1854, . .	30.2 "	31.3 "
"	" 4 "	since " " . .	21.0 "	21.8 "
May.	Mean of 37 "	prior to January, 1854, . .	30.3 "	30.4 "
"	" 5 "	since " " . .	31.8 "	37.2 "
June.	Mean of 23 "	prior to January, 1854, . .	31.1 "	32.4 "
"	" 4 "	since " " . .	33.5 "	33.7 "
July.	Mean of 10 "	prior to January, 1854, . .	29.4 "	28.2 "
"	" 10 "	since " " . .	31.2 "	33.2 "
August.	Mean of 13 "	prior to January, 1854, . .	27.3 "	34.0 "
"	" 13 "	since " " . .	25.0 "	30.7 "
September.	Mean of 10 "	prior to January, 1854, . .	24.4 "	28.8 "
"	" 11 "	since " " . .	30.7 "	28.0 "
October.	Mean of 15 "	prior to January, 1854, . .	25.7 "	24.6 "
"	" 10 "	since " " . .	26.3 "	26.4 "
November.	Mean of 14 "	prior to January, 1854, . .	24.7 "	24.7 "
"	" 3 "	since " " . .	21.7 "	22.5 "
December.	Mean of 15 "	prior to January, 1854, . .	25.7 "	24.1 "
"	" 13 "	since " " . .	23.8 "	22.9 "

The showing of this tabular statement is very encouraging. It shows generally that as these routes, with the winds and the currents by the way have become better understood, there is a shortening of passages. The total average gain from 50° S. to San Francisco, since the publication of the last edition, has been a day. The gain by the month has generally been marked, except for September. Here the loss to the equator

has been 6 days. The gain for January, February, March, and April, has been from 5 to 10 days each. It is interesting to mark this improvement.

The Farallones, seven small islands about thirty miles from San Francisco, are in the fair way to the harbor. They afford a fine landmark, and should be made by all inward-bound vessels. The course from the South Farallone to the mouth of the harbor is about N. 73° E., *true*, distance 27 miles; or by compass N. E. by E. ¼ E. "The fort on the south point of the island of Alcatraces," is said to be the best course in.*

Vessels upon approaching The Heads of San Francisco, especially in the winter months, are liable to be beset by fogs. I have reports of some vessels that have had fine runs all the way from the United States; and yet, when they got almost in sight of the port, have been enveloped with and delayed by fogs for many days.

The positions of the following named points or places along the coast of California have been determined by the Coast Survey. They differ somewhat from the Wind and Current Charts; I therefore quote them in this place:—

San Clemente (S. E. end of Island of San Clemente)	33° 00′ 00″ N., 118° 34′ 00″ W.
San Nicholas (S. E. end of Island of San Nicholas)	33° 14′ 12″ N., 119° 25′ 00″ W.
San Luis Obispo (Bay of San Luis Obispo)	35° 10′ 37″ N., 120° 43′ 31″ W.
San Simeon (Bay of San Simeon)	35° 38′ 24″ N., 121° 10′ 22″ W.
†Point Pinos (Bay of Monterey)	36° 37′ 59″ N., 122° 00′ 10″ W.
Prisoner's Harbor (Island of San Miguel)	34° 01′ 10″ N., 119° 40′ 00″ W.
Cuyler's Harbor (Island of San Miguel)	34° 00′ 00″ N., 120° 20′ 27″ W.

FROM PANAMA TO CALIFORNIA AND THE NORTHWEST.

The passage under canvas from Panama to California, as at present made, is one of the most tedious, uncertain, and vexatious that is known to navigators.

The voyage from Valparaiso to California is a shorter one, in point of time, than is that from Panama, though the latter, as it regards distance, is not half so long as the former.

A brother officer of the navy, now no more, writing from San Francisco several years ago, said:—

"I learned, on my arrival at Panama, that great numbers of sailing vessels were in the habit of resorting thither for the purpose of taking passengers and freight to San Francisco; but to my surprise I

* See Sailing Directions by Captain Cadwallader Ringgold, U. S. N., 1851.

† The only place named on the Charts. The others are small towns and harbors, the names of which are not on the Wind and Current Charts, though the places for them are.

The object of these Charts should not be forgotten by navigators. They are intended to illustrate the winds and currents; to show the tracks of vessels at sea, and to serve the practical purposes of the navigator until he reaches the land, when it is presumed he will be guided by Pilot's or local charts, and not by the Track Charts, for running into port.

heard that they seldom made the passage under 90 days, and often were 120 days on the way. There were then many vessels there, all ready to sail, and among them the clipper ship Hornet, none of which has yet arrived, though 53 days have intervened.

"One of the clipper ships some time since made the passage in 45 days, by standing to the southward as if bound to Callao, and making all her westing in the S. E. trades, south of the line. This is such a roundabout way of getting to San Francisco from Panama, that there must be something wrong in the courses steered by the vessels which take the northern passage. It is well known that there is a strong westerly current running past the Galapagos Islands, which, by my own experience on one occasion, I found to be sixty miles in twenty-four hours. This current extends to the eastward almost to Point Malo, and westerly entirely across the Pacific, though not so strong as in the vicinity of the Galapagos. It strikes me that navigators, with proper instructions as to this current and the prevailing winds, ought always to make this passage in certainly not more than forty days.

"Knowing that you had few,* if any abstracts of this passage, I took the liberty of telling Captain Goodrich that these logs would be valuable to you, and suggested that he get as many of them together as possible and send them to you."

That this voyage can, with a better knowledge of the winds and currents than navigators now possess, be shortened very considerably, I have no doubt.

But, unfortunately, only a few of the vessels in the Panama trade send me abstracts of their logs.

As soon as I can collect materials enough to justify a discussion of this passage, I will undertake it. In the mean time, drawing upon such slender sources of information as I chance to have, I venture the following suggestions as to the route from Panama to the northward and westward. I say *suggestions*, for my information is not sufficient to justify the application of the more positive term of Sailing Directions to the remarks I have to make.

I have more than once, while preparing this work, called the attention of navigators to the system of monsoons off the Pacific coast of Central America. It is this system of monsoons and the calms, or equatorial doldrums as they are called, which are always to be found between the N. E. and the S. E. trade-winds, or between the monsoons and each of these two systems of winds, that contribute so much to the prolongation of the passage from Panama.

Of course, where two winds meet from different quarters, every navigator knows he must have a belt of calms or light baffling airs; for a wind from the N. E. and a wind from the S. E. cannot blow each at the same time and place. Therefore, when two such winds meet, their line of meeting is marked by calms and baffling airs.

Now, my investigations have been carried far enough to show that at certain seasons of the year, a vessel bound from Panama to California, must cross at least three, at some seasons four, such meetings of winds, or bands of calms, before she can enter the region of N. E. trades. Hence the tedious passage.

* I still have *very* few.

But, although the researches connected with these Charts have revealed this fact, the materials upon which they are founded are not sufficient to show with certainty the best way of avoiding these calm and baffling regions.

In the absence of more especial information, and in view of the important interests to be subserved by a shortening of the passage from Panama to California and Oregon, I venture the following suggestions as to that passage. These suggestions are derived from the light which the experience of those Panama traders whose logs I have, cast upon the subject. But this light is feeble, because the materials whence it is derived are meagre. Still, they amount to several thousand observations carefully made; and in the aggregate they are worth more than the experience of any single navigator in that trade can possibly be. Nevertheless, I do not ask for them that degree of confidence to which the Sailing Directions given in this work are generally entitled. These suggestions, added to individual experience, will probably be found by navigators to be of some service.

In the discussion of the winds as it is conducted for the Pilot Charts, Panama and its approaches are included between the parallels of 5° and 10° N. Between these parallels, and east of 85° west, it appears, from the observations which have been discussed, that the prevailing winds in November, December, January, May, June, and July, are between N. W. and S. W., inclusive; that in December, January, February, and March, they prevail about one-fifth of the time from the northward and eastward; that calms are least prevalent in the month of March, the prevailing wind for March being N. W.; and for June S. W.; though N. W. winds are also frequent in June; and that, for the other months, the observations are too few to give any indication as to the prevailing winds.

Between the same two parallels, but to the west of 85°, and as far as 95°, the prevailing winds are in December, January, and February, N. E.; in March and April they are variable, prevailing alternately from N. E. and N. W. In May, June, July, August, and September, they prevail from south to S. W. inclusive; in October, from S. E. to S. W., inclusive. In November, they are inclined to variable; though from S. E. by the way of south to W. S. W. is the favorite quarter.

It is, moreover, indicated that to the east of 80° the winds in December, January, and February, prevailing as they do from the northward and westward, are generally favorable for getting to the southward and westward, by steering S. S. W. or S. W.; that in May, calms are frequent, and the prevailing points of the wind are decidedly W. S. W., S. W., and S. E.; and in June, W., W. S. W., S. W., and N. W.; but as the favorite point is west, and calms are not so frequent as in May, June appears to be a more propitious month than May for crossing the parallel of 5° N. by a southwardly course from Panama. Between 5° and 10° N., for the other months I have not observations enough, to the east of 80°, to justify me in any remarks as to the winds.

Neither have I observations enough for January, February, or March, to the east of 80°, and between 0° and 5° N., to authorize deductions; but for all the other months of the year, they are abundant. They show that, to the east of 80°, between the equator, and 5° N., the winds are steady between S. E. by the south to west, and that calms are most frequent in this part of the ocean during the months of December

and April. The points from which the winds most prevail are, in December, S. W.; in April, S. S. W., and S. W.; in May, June, and July, S. W.; in August, S. S. W., and S. W.; in September, S. W.; in October and November, from S. E., to W. S. W.

Between 80° and 85° west, from the equator to 5° N., the prevailing direction of the wind, all the year, is between S. E., and west by the way of south; though from March to August, inclusive, it is most inclined to be variable. In December, March, and April, calms are most frequent.

Between 85° and 90°, the prevailing quarter for the wind, all the year, from the equator to 5° N., is between S. E., and S. W. It is most variable from January to June, inclusive. In March and June, the N. E. trades are frequently found here; calms are most prevalent in March.

Continuing west between the same parallels, the region from 90° to 95° west seems to be, of all, the most liable to calms the year round. From October to January inclusive, they are not so frequent as in the other months, being less frequent in October. From S. E. to S. S. W., is the ruling quadrant for the winds here, all the year; though from January to June inclusive, they go from N. E., around by the way of east, to west.

To the west of 95° they are steady between S. E. and south, except from January to May inclusive. In January, February, and March, they often get as far north as N. E., and in April and May, as far as E. N. E.

Now, then, after carefully studying this description of the wind, derived it is true from no great abundance of materials, I have to suggest the following routes for the consideration of navigators bound northwest from Panama.

From the Bay of Panama make the best of your way south until you get between 5° N. and the equator.

Being between these two parallels, it will be for the navigator to decide whether he will shape his course west, and keep between them until he crosses the meridian of 95° west, or whether he will cross the equator, and make his westing in south latitude, with the southeast trades on his quarter. The winds that he finds between 5° and the line should decide this question for him. If he can get west here, with a good breeze, he should crack on, and when his good wind leaves him, steer S. again.

If the passage from Panama be attempted in January, February, March, April, May, or June, time will probably be saved by going south of the equator; for, at this half of the year, the northeast trades and the equatorial doldrums are often found between the equator and 5° N. Between the meridians of 80° and 85° west, in this part of the ocean, these winds and calms are found even in the months of July and August. Therefore, in coming out of Panama, and after crossing 5° N., in any season, make a S. W. course, if the winds will allow. If the wind be S. W., brace up on the starboard tack; but if it be S. S. W., stand west, if it be a good working breeze. But if it be light and baffling, with rain, know that you are in the doldrums, and the quickest way to clear them is by making all you can on a due south course.

Suppose that, after crossing 5° N., you have got to the west of 85° without having crossed the equator. Now, if the time of the year be in that half which embraces July and December, the prevailing

winds will be between S. E. and south inclusive, and the course is west as long as there is a breeze; as soon as the breeze dies away, and you begin to fight the baffling airs, conclude that you are in the vicinity of the doldrums that are often found here either between the N. E. and S. E. trades, or between one of these trades and the system of southwardly monsoons that blow north of the line, and between the coast and the meridian of 95° west.

These belts of doldrums lie east and west, and the shortest way to cross them is by a due north and south line; therefore let it be a rule, whenever the navigator finds himself in one of these calm belts, to make all the latitude possible, for by that means he will soonest clear it.

Having crossed the meridian of 95°, stand away to the northward and westward with a free wind.

West of longitude 100°, and between the parallels of 5° and 10° N., the winds, in the months of November and December, are variable between N. E. and south, by way of east. In January, February, and March, they are quite steady as N. E. trades. In April, they are variable. The doldrums are generally found between those parallels, in this month. During the rest of the year, the winds are all the time between S. E. and S. W.

It will be well to cross the parallel of 10° N. at least as far west as the meridians of 105° or 110° W. Here, between the parallels of 5° and 10° N., the winds in November are steady from S. S. E., and S.; December, April and May are the months for the doldrums in this part of the ocean.

Having crossed the parallel of 10° N., between 105° and 110°, the navigator is then in the fair way to California. See Sailing Directions for California.

In making the west coasts of Mexico and the United States, the kelp is said to form an excellent landmark. This weed is very long, and grows on the rocks at the bottom. When, therefore, in approaching the coast, you come across lines or swarths of tangled kelp, its being tangled or matted is a sign that it is adrift. It is afloat in deep water, and you may sail boldly through it without fear. But when you come across it tailing out straight, it is then fast to the rocks at the bottom, and it is dangerous to get among it.

Vessels out of San Francisco intending to touch at Panama or any of the ports south, should stand out well from the Mexican coast. Information as to the best route for these passages is wanting. But I should with such information only as I at present have, with regard to this navigation, feel disposed, were I bound from San Francisco to Panama, to steer straight for the line somewhere about 105° west, and stand on south until I could, with the S. E. trades, run in on the starboard tack for the land.

ROUTES BETWEEN CALIFORNIA AND ASIA.

This voyage is the counterpart of the route, going and coming, between the Capes of Virginia and the Straits of Gibraltar; with this difference, that the Pacific Ocean is much broader than the Atlantic, and that the winds are much better developed out upon the Pacific, than they are in the Atlantic; and, therefore,

the passage each way, between California and China, will be a more certain passage than that between the Capes of Virginia and the Straits.

The distance between California and China or Japan being nearly double the distance between the United States and Europe, a vessel navigating those waters has a wider range in latitude than one trading across the Atlantic has, in which to hunt good winds. All vessels going west from California will, almost of necessity, stand to the southward and westward from the trades, and all vessels from China or Japan, coming this way, will first make for the variables, which they will find strong and good from the westward, between 35° and 40° in winter and spring; between 40° and 45° in summer and fall. Those mariners who understand the navigation between the Capes of Virginia and Europe, will have no difficulty about the route both going and coming, between California and China. The only difference is that in the latter voyage they can, without so much inconvenience, go further both to the north and the south for the sake of better winds.

In summer and fall, vessels bound to China or Japan need not go as far south for "steady trades," as they do in winter and spring.

The following from gentlemen navigating the North Pacific, will serve to illustrate the rule as to these routes. In order to enter into an elaborate discussion of them according to the month, the records of *many* journals must be first consulted, and when my corps of observers shall furnish these, I shall, I hope, be ready for the task.

Clipper ship Sword-Fish (Charles Collins), San Francisco to China.

June 17, 1853. Lat. 35° 25′ N.; long. 126° 35′ W. Sailed, 2 P. M. pilot left; 4 P. M. lost use of mainsail, gallantsail; stay parted; foggy. Distance sailed, 236 miles.

June 18. Lat. 32° 30′ N.; long. 132° 7′ W. First part, clear; ends foggy. Distance sailed, 340 miles.

June 19. Lat. 30° 36′ N.; long. 130° 34′ W. Fair breeze, hazy weather. Distance sailed, 280 miles.

June 20. Lat. 28° 40′ N.; long. 140° 49′ W. Fair breeze, hazy weather. Distance sailed, 250 miles.

June 21. Lat. 26° 53′ N.; long. 144° 23′ W. Trades, pleasant weather. Distance sailed, 225 miles.

June 22. Lat. 25° 25′ N.; long. 147° 46′ W. Trades, pleasant weather. Distance sailed, 202 miles.

June 23. Lat. 23° 56′ N.; long. 151° 14′ W. Trades, pleasant weather. Distance sailed, 201 miles.

June 24. Lat. 22° 49′ N.; long. 153° 27′ W. Light airs and calms. "*Blow, blow.*" Distance sailed, 142 miles.

June 25. Lat. 21° 30′ N.; long. 156° 40′ W. Light airs; 5 A. M., "Land ho!" Morree Island. Distance sailed, 208. Total distance run, 2,084 miles—average per day, 232 miles.

June 26. Lat. 20° 5′ N.; long. 160° 15′ W. Light breeze; 2 P. M. in the passage of the islands; *passage eight days and two hours.*

June 27. Lat. 18° 33′ N.; long. 162° 46′ W. Very light airs. Distance sailed, 180 miles.

June 28. Lat. 18° 34′ N.; long. 166° W. Very light airs. Distance sailed, 181 miles.

June 29. Lat. 18° 37′ N.; long. 170° 4′ W. Good breeze this day. Distance sailed, 240 miles.

June 30. Lat. 18° 37′ N.; long. 173° 21′ W. Calm, and light airs. Distance sailed, 190 miles.

July 1. Lat. 18° 50′ N.; long. 176° 48′ W. Bent old sails; ship does not sail so fast as with heavy suit; 1½ knot difference by log.

July 2. 18° 38′ N.; long. 180° W. Light trades on meridian. Distance sailed, 195 miles.

July 4. Lat. 18° 38′ N.; long. 176° W. Fine trades. Distance sailed, 230 miles.

July 5. Lat. 18° 43′ N.; long. 172° 51′ W. Light trades; *this the fourth at home.* Distance sailed, 190 miles.

July 6. Lat. 18° 47′ N.; long. 169° 16′ W. Light trades, squally. Distance sailed, 212 miles.

July 7. Lat. 18° 52′ N.; long. 165° 29′ W. Fair trades; heavy swell. Distance sailed, 228 miles.

July 8. Lat. 18° 49′ N.; long. 161° 53′ W. Fair trades; heavy swell. Distance sailed, 210 miles.

July 9. Lat. 18° 42′ N.; long. 157° 25′ W. Fair trades; pleasant. Distance sailed, 262 miles.

July 10. Lat. 18° 35′ N.; long. 154° 38′ W. Light airs. Distance sailed, 157 miles.

July 11. Lat. 18° 25′ N.; long. 150° 27′ W. Light airs; hot and sultry. Distance sailed, 222 miles.

July 12. Lat. 18° 19′ N.; long. 146° 54′ W. Light airs; hot and sultry; ends squally. Distance sailed, 229 miles.

July 13. Lat. 18° 20′ N.; long. 143° 28′ W. Light airs; 5 P. M. "Land ho!" Islands of Pagon and Alamaguan (Ladrone Islands); 8 P. M. passed through all clear. Distance sailed, 210 miles.

July 14. Lat. 18° 19′ N.; long. 139° 57′ W. Begins light air; ends squally. Distance sailed, 210 miles.

July 15. Lat. 19° 27′ N.; long. 135° 38′ W. Squally; much rain; lightning and thunder. Distance sailed, 265 miles.

July 16. Lat. 21° 4′ N.; long. 127° W. Commences very warm; 2 A. M. sharp chain lightning; looks very bad; expect a typhoon; in all sail except fore and main topsails, they close reefed; battened down all hatches. Daylight, strong breeze; overhead clear; horizon foul, and looks bad; this may be caused by the ship's drawing in between the N. E. trades and S. W. monsoons. The ship went nine knots, wind abeam, under two close-reefed topsails; made sail as required. Distance sailed, 260 miles.

July 18. Lat. 27° 28′ N.; long. 125° 14′ W. Strong breezes midnight, all sail. Distance sailed, 253 miles.

July 19. Lat. 30° 50′ N.; long. no observation. Thirty-six hours in this day. 11 hours 30 min. A. M. made Saddle Island; 11 P. M. anchored for daylight off Gutzlaff Island (Shanghai entrance). Distance sailed, 224 miles. Passage 32 days, 9 hours.

Whole log distance run, 7,200 miles; average per day, since leaving California, 225 miles.

Daylight took Shanghai pilot, and proceeded up the Yang-tse-kiang.

SHANGHAI, *October 4th to 19th*, 1854.

DEAR SIR: Last year, I crossed from San Francisco to this place in the Surprise, in the months of July and August, and had a good run of 38 days across. Your Wind and Current or Pilot Charts were not then out I, think, at least I had not seen them; I, for want of some such directions as you give, took my own course, and kept far to the north of the Sandwich Islands, and had a tolerable good run all the way with much fine weather, while the Mystery and some others went further south in the old track, and had much wet and squally weather, and longer passages generally. You have my abstract and some others for reference. This voyage I left nearly one month later, and although I have your Wind and Current Charts of the Pacific, on this passage, I kept north of all the tracks given, and have had very light winds all the way across;* in fact, my sails have flapped against the masts all the way; you will see my track by abstract, which I forward you. I sailed, after leaving San Francisco, 5,580 miles by log, without taking in a skysail or a royal studding-sail, the wind veering and hauling from E. S. E. to E. N. E. generally; weather fine as one could wish, and too hot to work in the sun much of the time. I passed over and near several spots where islands are laid down in my Charts; I saw none of them except Gardiner's Island, off N. W. of the Sandwich Islands, in the neighborhood of the other mentioned islands. I saw many birds of various kinds, and have mentioned them in my abstract as you request, and have also tried the temperature of the water, &c. My chronometers are very near correct, I find on my arrival. I passed between North and Sulphur Islands, two of the Volcano Group, and send you a rough sketch of them. It may be of use to some one, as I have no guide for any of these islands, whether they are high or low, and some of them may be safely run for in the night, and others must not. I have seen all of this group, and they are in the track of vessels bound for Shanghai from San Francisco. The north and south ones may be run for any time, being high and bold; but the middle one is low to the eastward, and cannot be seen far in the night; the high hill is on the western side. I ran for Bungalow Island, which I find on my chart, and made it just as I should, within an hour. *It is there*, and no mistake. It is a long, moderately high island, and looks, in a view I took of it, much like a sperm whale; is tolerably long, looks green; the wind being north, I could not get any nearer it than just to make out that it was certainly an island, and distinct from any other. I mention this, as I have a work, published in London, called *North Pacific Directory*, by one Alexander G. Findlay for Laurie, in which he jumbles up a mess of islands, Bungalow, Harbor, and Crown Islands, all as one, or supposed so by Captain McMichael, see page 1158: Montauk Islands! Oct. 1st, at 4 P. M. Bungalow Island bore N. N. E. and a kind of haze hid it. In half an hour more, at 5 P. M., saw land N. W. by N. of us, extending as far to the west as we could see, which I knew to be Ousima Island, as I saw the same last year and ran for the S. W. end for the passage I intended to take through the chain of islands from Formosa to Kamtschatka. I ran down and lay off until daylight; found considerable current drifting me about, which is not worth my mentioning, as no doubt Com-

* You were too near the calms of the horse latitudes.—M.

Ringgold will ere long send you a grand account of all these islands, and they must be a very interesting discovery for him to make, as they never have been surveyed that I know of, otherwise their names and place would be in Bowditch's Navigator, as that work has many islands that do not exist. At daylight, Oct. 2d, I found myself in the Passage almost becalmed, going through very well until 10 A. M., when the tide changed, and not having any wind, I drifted away down towards Kakarooma, a splendid-looking island, with long low points at every view of it, and high land in the interior. Saw no shoals off this island, except a high lot of rocks about five miles from the N. W. point of the island, and about one-third of the way from this island to Ousima, or an island off the S. W. side or end of Ousima. The sea breaks heavily all around this heap of rocks, and in places between it and the main island of Kakarooma, and although there is a wide passage between that and the shore, I would not attempt it unless surveyed. The sides of the island of K—— seem to be in a high state of cultivation, fields and rows of trees like hedges, and farms finely laid out, from the high land down to the sea shore; saw smoke ascending from many places, one after another, as if it were given for a signal that something strange was coming, and I have no doubt that our appearance was telegraphed all over these islands, on both sides of the passage, as we saw from hill to hill, as far as we could land. But although near enough to see what we supposed was terraces of fine trees across the slopes in valleys, we did not see anything that looked like a house or habitation. White patches on the sides of the hills were at first taken for houses, but proved to be rocks of various colors, from black to very white, and some hill-sides were so full of white boulder-stones, that they looked like a flock of white cattle or sheep. I saw the same last year, and, as they all remain the same, they cannot be animals.

On the Ousima side, we saw the plainest, having been nearer than the other; this coast is full of deep bays, large and small islands, and off all of the headlands and points there are large reefs and rocks, above and under water, and on which the sea breaks with considerable violence in a moderate time. There are apparently passages among them all, as the rocks rise high and abruptly and bluff on the most of the points. We saw no sign of any native vessels on either voyage, except a small sampan, similar to a Chinese bum boat, containing four dark and swarthy looking fellows. They came out from behind one of the islands in the morning, and passed near us, so near that they were somewhat afraid of us. A breeze struck us and them at the same time; they were standing over towards Kakarooma Island. There is a rip caused by tides, or meeting of two seas across the channel, and before we come to it, it looks very much like breakers, and if the weather should be rough, I have no doubt it would be taken for breakers, for a reef extending entirely across the passage; in fact Capt. M. Michael, of the Montauk, says, in his description of these islands, page 1158, *North Pacific Directory*, that there is no passage between the long low islands of the south and the high ones of the north. I do not know any one that has passed between these islands; you have an opportunity of knowing, and have perhaps received some communications about them which I should be glad to see in some of your books, and I hope any one who passes islands of this Pacific will describe them. Lisiansky is mentioned in the work named above, and very correctly described. I have seen it, and should not run for it in the night, as a ship could be lost on reefs so far off from the island, that it

could scarcely be seen from off deck in the daytime. I would say that on the N. E. part of Kakarooma Island, probably by some called Crown Island, there is a *beach*, apparently sand beach, extending almost the entire length of the islands, while on the other side, on Ousima Island, the shore is high and bluff, and not a beach to be seen. Ousima, I should think to be about 100 miles around it, and the other island as much as 80 miles in circumference; I guess this, of course, it may be more or less; this guess will give you an idea of the size of the small specks on the Charts. I could say more of these islands, but thinking probably you may have a much more correct account of them, I will close. I should like much to be of a party to survey them.

I call these straits Surprise Straits, she having been through them twice.

Oct. 20. Since writing the above, have arrived in 55 days from San Francisco; found the Golden Gate in before me; she sailed 10 days after me, and with a strong N. E. wind steered west, and had a strong breeze all the way across, excepting a few days. He saw a group of islands 25 miles west of Clove Island, not on any chart or in any book that he or I have. Capt. Pope informs me that there is a survey of those islands I passed between, by the French. I suppose we shall have it soon. The Sword-Fish was 42 days from San Francisco to Hong-Kong; sailed two days before me; I presume he went well south. I beat all the passages across last year, in the same track I took this year and was beaten by all.

I sent my abstract from California before I noticed the remark in your Directions to keep it entire until my return to the United States. A brig came in to day dismasted in a typhoon off Sulphur Island that lasted 3 days. She was dismasted Oct. 4th, the day that I arrived, and I had very fine weather. This brig came across as I did in 22° to 24° and had very light winds all the way until she took the storm.

Respectfully your obdt. servant,

CHAS. A. RANLETT.

LIEUT. M. F. MAURY,

U. S. Observatory, Washington.

Herewith is an abstract log of the barque *Isabelita Hyne*, under my command, on her late voyage from Hong-Kong to San Francisco. I cannot give you the air and water, as my thermometer was broken. The barometer is entered for every noon. The observations are at noon, as corrected from nearest observation to noon, apparent time.

June 8, 1854. Sailed from Hong-Kong for San Francisco at 11 A. M.; at 8 P. M. passed through the little Lema Passage; wind light and squally from E. N. E.

June 9. Calm; at 10 A. M., great Lema North Point bore N. by W., distant 15 miles.

June 10. Gentle breezes E. N. E.; fine weather; 6 A. M., fair breezes; at 9½ A. M., main trussel-tree gave way, and everything came down with it; at 10 hours 40 min. came to anchor in 10 fathoms water. Lat. 22° 27′ N.; long. 114° 39′ 30″ E.

June 11. Repairing.

June 12. At 8 A. M., wind E. N. E. to E. S. E.; squally; got under way and stood S. E. At 12 M., lat. 22° 08′; long. 115° 03′ E.

June 13. Wind steady at E.; squalls from E. N. E. to S. E., with heavy rain, some thunder and lightning; 3 A. M. got soundings in 23 fathoms; S. by E. from Lamrock reef; latter part, heavy squalls of wind and rain. Lat. 23° 22′ N.; long. 118° 18′ 20″ E.

June 14. At 1 P. M., soundings on Western Farmosa Shoal, in 15 fathoms. Wind: light, E. S. E.; thick and rainy; latter part, gentle breezes S. S. W.; all drawing sail set. Barometer, 29.55. Lat. 24° 54′ 31″; long. 120° 10′ E.

June 15. First and middle parts, fine S. W. winds; latter part, moderate, with appearance of N. W. winds. Barometer, 29.60. Lat. 26° 40′ N.; long. 122° 50′ 13″ E.

June 16. Light winds and rain; variable; heavy clouds from N. W. to N. E. 1 A. M. wind from N. E. suddenly, with heavy squall; latter part, calm, with rain; drifted 12 miles in 6 hours, S. by E. Barometer, 29.60. Lat. 27° 25′; long. 125° 00′ E.

June 17. First part, wind E. N. E.; middle part, same; latter part, S. E. with rain. Barometer, 29.45. Lat. 27° 03′; long. 126° 52′ 07″ E.

June 18. First part, strong breezes from S. E., with heavy rain squalls; middle part, wind S. S. E. to S. S. W. in squalls, heavy; latter part, same; run through between the Tanajasami Islands, and the coast of Japan; took in light sail; bad sea, and heavy rip. Wind: S. W. Barometer, 29.30. Lat. 30° 55′; long. 131° 03′ 27″ E.

June 19. Through this day wind from S. S. W. to W., with heavy squalls. Barometer, 29.35. Lat. 32° 20′; long. 135° 02′ 12″ E.

June 20. First part, same; middle part, wind veered suddenly to N. W.; latter part, wind N. W. by W.; heavy swell from N. N. E.; fine weather; passed between Brisseir and Prince Island. Barometer, 29.50. Lat. 34° 12′; long. 140° 00′ E.

June 21. First and middle parts, light winds N. N. W.; latter part, calm. Barometer, 29.70. Lat. 34° 50′; long. 142° 07′ E.

June 22. First part, calm and hot; middle part, gentle breezes S. E.; latter part, same, and fine weather with N. W. swell; southerly current. Barometer, 29.70. Lat. 36° 30′; long. 145° 18′ 27″ E.

June 23. First part, strong breezes S. E. to S.; middle and latter parts, from S. to S. W.; heavy squalls, and plenty of rain; heavy swell from N. N. W. Barometer, 29.40. Lat. 28° 50′; long. 150° 09′ E.

June 24. Throughout, strong gale S. W. to W. S. W.; heavy rain; same swell. Barometer, 29.30. Lat. 40° 16′; long. 154° 53′ 36″ E.

June 25. Still blowing heavy; split maintopsail; sent up new one. At 4 A. M. wind veered suddenly to N. W.; clear and fine, with strong breeze. Barometer, 29.35. Lat. 41° 20′; long. 159° 32′ E.

June 26. First part, strong breezes, and bad sea; decks full of water; took in both quarter boats; at 4 P. M. wind veered suddenly to W. by S.; heavy squalls. Barometer, 29.18. Put in 2 reefs. Latter

part, wind N. W., more moderate, with heavy squalls; heavy strata of clouds in the north, and bad N. N. E. sea. Barometer, 29.15. Lat. 41° 12′; long. 164° 06′ E.

June 27. Still same; barometer, 29.25; swell N.; latter part, same. Barometer, 29.30. Lat. 41° 18°; long. 171° 28′ E.

June 28. Still same; impossible to keep the sea from boarding; heavy sea from N. N. E.; another from S. W.; everything calked and battened down; no ordinary gale; 8 A. M. more moderate; still heavy squalls. Barometer, 29.40. Lat. 41°; long. 176° 05′ E.

June 29. First part, more moderate; made all drawing sail; clouds breaking; wind N. N. W. to W. N. W.; middle part, same; latter part, heavy squalls from N. N. W. Barometer, 29.60. Lat. 41° 34′; long. 179° 54′ 30″ W. Crossed meridian.

June 30. First part, light breeze N. N. E., with squalls from N. E.; middle and latter parts, calm. Barometer, 30.10. Lat. 41° 40′; long. 178° 39′ W.

July 1. First part, light air N. E.; middle and latter parts, calm, and thick fog. Barometer, 30.10. Lat. 41° 32′; long. 178° 07′ W.

July 2. Dead calm, with rain.

July 3. Catpaws from E. N. E. to S. E.; made nothing.

July 5. Perfect calm, and fine.

July 6. First part, light easterly airs, thick and rainy; middle part, same; latter part, wind E. S. E., light. Barometer, 30.05. Lat. 42° 03′; long. 178° 00′ W.

July 7. First part, gentle breezes S. E.; thick fog, with rain squalls: standing N. E., with studding-sail set on starboard side; saw a barque standing east by the wind. Barometer, 29.95. Lat. 42° 30′; long. 177° 19′ W.

July 8. Light air from S. to E. S. E.; thick fog; plenty of whales and birds. Barometer, 30.30. Lat. 42° 45′; long. 175° 10′ W.

July 9. Throughout, light winds E. S. E. to S. S. E.; thick fog, sometimes drizzling rain. Barometer, 30.30. Lat. 42° 57′; long. 172° 12′ W.

July 10. Throughout, light winds S. E. to S.; thick fog, drizzling rain, clear at noon. Barometer, 30.20. Lat. 43° 04′; long. 168° 24′ W.

July 11. First part, gentle breezes S.; middle part, calm; latter part, light air N. N. W.; saw plenty of whales and birds; weather unsettled; no appearance of wind. Barometer, 30.15. Lat. 43° 02′; long. 165° 10′ W.

July 12. Light airs southwesterly, and cloudy; swell from N. N. W.; middle and latter parts, good breezes S. S. W. to S. S. E.; fine and pleasant. Barometer, 30.05. Lat. 43° 00′; long. 160° 30′ W.

July 13. First part, light winds S. to S. S. E.; middle part, to S. E., thick fog; latter part, wind same; fine weather. Barometer, 30.15. Lat. 43° 09′; long. 156° 54′ W.

July 14. First part, light winds same, with rain; middle part, same; latter part, fine weather. Barometer, 30.30. Lat. 43° 17′; long. 153° 24′ W.

July 15. First part, light S. E. winds; middle part, nearly calm, with rain; latter part, S. E. to E. S. E., with fog and rain. Barometer, 30.35. Lat. 43° 32′; long. 149° 10′ W.

July 16. Throughout, light winds from S. E. to E. by S.; long swell from N. N. W. Barometer, 30.40. Lat. 44° 19′; long. 144° 53′ W.

July 17. First part, light air E. by S.; any quantity of Portuguese men-of-war; middle and latter parts, light airs, with squally appearances easterly; swell from N. W. Barometer, 30.40. Lat. 44° 50′; long. 142° 24′ 30″ W.

July 18. First part, calm, and catpaws from E. N. E.; latter part, squally, N. E. by N.; saw a schooner standing northwesterly. Barometer, 30.40. Lat. 43° 58′; long. 142° 00′ W.

July 19. First part, gentle breezes N. N. E., with squalls N.; middle and latter parts, strong and heavy squalls, with bad sea N. N. W. Barometer, 30.20. Lat. 42° 12′; long. 136° 40′ W.

July 20. First part, strong breezes and squally, bad sea N. to N. N. E.; middle part, more steady; latter part, moderate N. E. by N. Barometer, 30.00. Lat. 40° 35′; long. 132° 03′ W.

July 21. First part, light airs and cloudy; middle and latter parts, gentle breezes N. N. E. Barometer, 29.95. Lat. 38° 10′; long. 127° 03′ W.

July 22. First and middle parts, light wind N., and misty; latter part, winds N. W., thick fog; at 12 M. Cape Rees bore, by estimation, S. E. ¾ E., distant 54 miles.

July 23. Thick fog; lay in with maintopsail to mast; at 10 A. M. cleared up; Point Bonitta bore N. E. by E. ½ E., distant 9 miles.

So ends this abstract. Variation is not allowed in any of the compassed courses in this journal.

You can see that I made a good run to the meridian, and I think that, if I had crossed it to the south of parallel of 40°, and not below 37°, I might have shortened the passage 10 or 12 days; but I crossed well north, expecting to find Lieut. M. F. Maury's strong N. W. winds; and, on the contrary, found light S. E. winds. I have crossed the meridian twice before at that season—once in 38° 10′, once in 37° 54′—and made the run to San Francisco in 12 days and 15 days. So, my advice is, do not cross the meridian north of 39° 30′; there will be mere westerly winds, with squally weather.

Your obedient servant,

REUBEN CALHOUN.

It is *possible* that Capt. Calhoun might have shortened his passage, by crossing that arbitrary line called the lower meridian, between the parallels of 37° and 40°; but it is probable he would have gained more had he crossed it 10° farther to the north than he did. In the first place, he would have saved several days' sail by sticking to the great circle route, which vessels from China may follow pretty closely, and which crosses the meridian of 180° in about 50°. The reason why he found the light winds he speaks of, was because he was too near the horse latitudes. The Trade-Wind Chart of the Atlantic, shows that the light airs of those latitudes frequently reach as far north as 37°, and farther, especially in summer, and at the very season he was making this voyage. On account of the great circle, the route from China to

California, is in distance from 800 to 1200 miles shorter than the route through the N. E. trades, *via* Sandwich Islands, &c., *from* California to China. It is well, especially in summer and fall, when the weather is mild, to bear this fact in mind.

The great circle from the free ports of China and Japan to California and the Columbia River, may be followed by sailing vessels all the year, and with less inconvenience than attends vessels on the northern route between New York and Liverpool. The route in the Pacific is free from icebergs, and is not more foggy than that in the Atlantic. As to the relative fury and frequency of the gales, I cannot speak.

ROUTES BETWEEN CALIFORNIA AND AUSTRALIA.

The great circle distance from South Australia to California, is about 7,000 miles, and vessels in the direct trade between Australia and the Pacific coasts of the United States, may have the choice of routes going as well as coming; going, the distance to be sailed, on account of detour for the sake of winds, is about 7,500 miles; returning, that is, coming this way by the eastern route, the distance is eight or nine hundred miles greater. With the exception of the N. E. trades, on the passage from New South Wales, or Victoria to California, the winds are fair, or may conveniently be made fair both ways. A good N. E. course can be made through the S. E. trades; and a N. N. W. course, on the average, through the N. E. trades. But these courses will not give easting enough for the California-bound trader, and it therefore becomes a question for him to decide, whether he will make up his easting in the variables south of S. E. trades, or in the variables north of the N. E. trades, for in both of those systems of variables westerly winds prevail.

In coming out of the Victoria ports, go south of Van Dieman's Land, or through Bass's Straits, as you have the winds and find it expedient.

Being south of Van Dieman's Land makes it convenient to pass south of New Zealand, if the wind be fair, as in the majority of cases it will be. Having passed south of New Zealand, steer for the parallel of 40° or 45° S., between the meridians of 150° and 140° W., thence for the equator between 120° and 130° W., crossing by a north course, both the horse latitudes of the southern hemisphere and the equatorial doldrums; then run through the N. E. trades as best you may, keeping a "rap full" and running up into the variables beyond the horse latitude calms of the northern hemisphere, if need be, to complete your easting and make your port.

If the winds be not fair for passing south of New Zealand, try Cook's Straits in preference to passing to the north of New Ulster.

If you pass through Cook's Straits, then stick her well to the eastward and take the eastern passage. On this passage, you should run down your easting pretty well before you get far enough north to be bothered by the baffling winds of the horse latitudes south. If these come as low down as 38° or 40° S., stand north the moment you feel them till you get the S. E. trades; then cross these and the N. E. trades, both as obliquely to the eastward as they will permit, with foretopmast studding-sail set.

On this passage, you will have finally to run down your easting when you get into the variables beyond the N. E. trades, and of course you will aim to reach the parallel of 38° or 40° N., or even a higher one north, to do this. How far you will go north depends somewhat upon the distance you may be west of California when you lose the N. E. trades. If you be only a degree or two from the land, you will steer straight for your port without caring to get to the northward of it; but if you be ten or twenty degrees to the west of it, or even further, then of course the distance to be run makes it an object to turn out of your way and go north in search of good winds.

Therefore, the choice of routes on this voyage resolves itself into the answer to this question: Is it best to make easting between the parallels of 40° and 50° S., or about the parallel of 40° N.? If the former, then the eastern route is the route; if the latter, then the preference should be given to the western route.

I give preference to the eastern route, especially and decidedly when the winds at starting are favorable for the east course. I have no doubt but that, as a general rule, the winds by the eastern route, both variables and S. E. trades, are much more steady and reliable than they are by the western route. Moreover, the distance from the Victoria ports, *via* south side of Van Dieman's Land and New Zealand, is not more than three or four hundred miles greater than it is by the most direct route that is practicable, and the chances of good winds, by the eastern route, will, in my opinion, amply make up for this increased distance.

It is proper for me to state here that I do not give these Australian sailing directions as directions that are founded on or derived from investigations into the routes actually pursued by vessels from Australia to California; but I give them as deductions drawn from the knowledge which I have acquired touching the general system of the winds and currents out upon the high seas.

The most difficult and uncertain parts of this passage will be in the time required to cross the three belts of calms, and to clear the winter fogs of California. But for these, the eastern passage, from Victoria to California, would be one of the most certain passages in the world.

The distance from Victoria to California cannot be accomplished under canvas, by the eastern route, much short of 8,700 miles. But driving captains, with clipper ships under them, may expect to average, one trip with another, along this route, not far from 200 miles per day. The clipper rate from Victoria to Cape Horn, will probably be upwards of 200 miles a day; for I feel assured there is no part of the ocean in which the winds generally will admit of more heavy dragging and constant driving than they will in the extra-tropical regions generally of the South Pacific, say on the polar side of 40° S.

Returning from California to the gold fields of Australia, the route out of San Francisco should be down as soon as possible into the N. E. trades, as though you were bound to China, India, or the Sandwich Islands, crossing the equator anywhere between the meridians of 140° and 150° west, according as you prefer to run down your westing principally in the N. E. or S. E. trades. I give the preference to the latter generally, because they are more steady, reliable, and certain than are their congeners of the northern hemisphere—at least such is the rule. The distance by this route to Bass's Straits will be about

7,500 miles; and an increase upon this of the average distance to be sailed on the passage going, together with the distance returning, will not amount, as before stated, to more than six or eight hundred miles.

Aim to cross 30° S., on the passage from California to Australia, in the neighborhood of 170° E.

Thence, the course is between Australia and New Zealand direct for your port.

In these passages, as on the California routes generally, navigators have to cross the calms of Cancer and of Capricorn, as well as those of the equator; which last are found between the N. E. and S. E. trade-winds, but upon different parallels, according to the season of the year.

It may, therefore, be remarked here, once for all—and which remark navigators bound either from the United States or from Panama to California are requested to bear in mind—that the barometer will often enable the navigator to tell when he has crossed these belts of calms, and entered the trades.

In the belt of equatorial calms there is an ascending column of air. All the atmosphere which the N. E. and S. E. trades pour into this belt, rises up and flows off by counter currents in the upper regions. Of course, then, the mean height of the barometer in the equatorial calms, is less than its mean height in the trades on either side. This difference does not, probably, exceed one-tenth of an inch (0.1 inch). But close attention to the barometer in and about these calms, will often enable the navigator to decide whether the winds he may have be really trade-winds or not; for after having been fighting these calms, if you get the wind from N. E. or S. E., as the case may be, and the barometer *rises*, then you may be sure that you have the trades.

I have frequently, in the course of this work, had occasion to allude to the equatorial calms, and the rains which accompany them. At this day, it is not sufficient to tell the navigator that things are so. He depends more upon the lights of reason and the convictions of his understanding, less upon faith and the *ipse dixit* of philosophers than he used to do. And, therefore, when facts and phenomena are now stated to him, his first question generally is, for the explanation of them. I admire this spirit, and have frequently, in the pages of this work, turned aside to pay homage to it. (See the illustration afforded by Dewey's *Meteorological Journal at Para*, p. 467, 5th edition.)

Where the two trade-winds meet, they and the vapors which they bring ascend, and it is then "the rainy season."

The observations of Dewey on the land, show clearly enough that, as the belt of equatorial calms passes over Para, the mean height of the barometer is less than it is in the extra-tropical latitudes generally, or than it is when the trade-winds prevail at Para.

There is no route on which close attention to the barometer, while crossing these calm belts, will be of more service to the navigator than on the California route from Panama.—See that Chapter, p. 689.

In the calms of Cancer and of Capricorn, there is a descending instead of an ascending current of air; therefore the barometer ranges higher, on the average, within those two calm belts than it does anywhere else. The difference, however, does not exceed the tenth of an inch (0.1). Close attention to this instrument will often enable the navigator to decide, when he has crossed this belt and got into the region of trades, even before he gets the wind from the trade quarter. He determines this by its fall.

The passage between Australia and California should be made ordinarily in from 45 to 50 days;—the passage to the east being rather the shorter; of course, clipper ships will occasionally make the passage in 37 days. See the remarks about the Farallones, in the Sailing Directions for California from the United States, page 689.

The log of the clipper schooner Heloise illustrates the western route from Australia to California.

Abstract Log of the Schooner Heloise (ATKINS DYER). *From New Castle, N. S. Wales, to San Francisco,* 1855.

Date.	Latitude at noon.	Longitude at noon.	Therm. attached.	Bar.	Hours of Fog A. Rain B. Snow C. Hail D.	WINDS. First part.	WINDS. Middle part.	WINDS. Latter part.
Dec. 25, 1854	33° 08′ S.	152° 20′ E.	67°	29.90		N. E. by N.	N. E. by N.	N. N. E.
26, "	34 09	155 16	68	30.00		N. N. E.	N. by E.	N. N. E.
27, "	34 15	159 00	68	29.98		N. N. E.	N. N. E.	N. N. E.
28, "	34 42	163 02	68	30.00		N. by E.	N. by E.	N. by E.
29, "	34 36	166 18	68	30.05		N. by E.	N. N. E.	N. N. E.
30, "	35 36	168 55	68	30.10		N. N. E.	N. by E.	North
31, "	35 29	170 30	68	30.20	B	W. S. W.	S. W.	S. E.
Jan. 1, 1855	34 40	172 01	67	30.15	2 B	S. E.	E. S. E.	E. S. E.
2, "	33 53	173 06	68	30.00		E. S. E.	S. E.	South
3, "	31 48	175 20	68	29.78		S. E.	S. E.	S. E.
4, "	30 11	177 34	70	29.85		East	East	East
5, "	28 00	179 51	71	29.80		E. by N.	E. by N.	E. N. E.
6, "	25 44	179 29 W.	73	29.80		E. N. E.	E. by S.	E. by S.
7, "	24 35	178 25	75	29.70	2 B	Calm	Calm	Calm
8, "	24 20	178 13	80	29.60	B	Calm	E. by N.	E. by N.
9, "	24 18	177 57	80	29.50	3 B	East	E. by S.	E. by S.
10, "	25 01	178 00	78	29.20	3 B	E. by S.	E. by S.	E. by S.
11, "	25 17	178 11	77	29.20	B	E. S. E.	S. E.	S. E.
12, "	24 40	177 03	78	29.50		E. S. E.	S. E.	E. by S.
13, "	23 02	175 51	78	29.60		E. by S.	E. by S.	East
14, "	19 58	172 40	80	29.78		E. S. E.	E. S. E.	E. S. E.
15, "	17 33	171 26	81	29.62		E. S. E.	E. S. E.	E. S. E.
16, "	14 33	169 00	82	29.58	2 B	Calm	N. by W.	N. N. W.
17, "	13 52	167 01	83	29.52	2 B	N. N. W.	N. by W.	North
18, "	12 40	165 29	83	29.50	B	North	N. N. W.	N. E. by N.
19, "	12 27	163 21	82	29.63	B	N. E. by N.	N. E. by N.	N. E. by N.
20, "	9 53	165 01	83	29.70	2 B	North	North	N. by E.
21, "	8 30	166 19	83	29.70		N. E.	N. E.	N. E.
22, "	5 30	167 41	83	29.67		N. E. by E.	N. E. by E.	N. E. by E.
23, "	3 11	168 40	83	29.65		E. N. E.	E. N. E.	E. N. E.
24, "	0 12 N.	169 23	83	29.65		E. N. E.	E. N. E.	E. N. E.
25, "	3 34	169 40	83	29.72		E. N. E.	E. N. E.	E. N. E.
26, "	6 44	169 19	83	29.72	6 B	East	E. N. E.	E. N. E.
27, "	9 02	169 47	83	29.76		N. E. by E.	N. E.	N. E.
28, "	12 11	170 30	80	29.78	6 B	N. E.	N. E.	N. E.
29, "	14 25	171 58	80	29.76		N. E.	N. E.	N. E.
30, "	16 52	173 00	80	29.75	3 B	N. E.	N. E.	N. E.
31, "	18 39	172 34	79	29.70		E. N. E.	East	S. E.
Feb. 1, "	20 48	171 40	78	29.64	B	S. W.	West	W. N. W.
2, "	22 40	168 34	78	29.60	2 B	W. N. W.	N. W.	N. W.
3, "	24 03	165 15	76	29.58		N. W.	N. N. W.	N. N. W.
4, "	24 51	162 03	75	29.52	B	W. N. W.	N. N. W.	Calm
5, "	25 28	160 58	73	29.81		S. W.	S. W.	S. W.
6, "	26 27	158 37	70	29.96		W. S. W.	W. N. W.	W. N. W.
7, "	28 00	155 18	68	29.86	B	W. N. W.	West	West
8, "	29 28	151 15	65	29.80	4 B	West	Calm	W. S. W.
9, "	30 21	148 05	65	29.70	6 B	W. S. W.	N. W.	N. W.
10, "	31 10	145 56	61	29.70	2 B	N. W.	West	S. W.
11, "	31 57	143 12	60	29.78	B A	S. S. W.	South	S. S. E.
12, "	33 35	139 00	62	29.98	2 A	S. S. E.	S. S. E.	South
13, "	35 07	134 48	63	29.98	3 A	South	S. S. W.	S. S. W.
14, "	36 14	131 28	63	29.98	2 A	S. W.	S. W.	S. W.
15, "	36 53	128 40	63	29.98	A	West	N. W.	North
16, "	37 12	123 05	62	29.98		N. W.		

Dec. 25, 1854. Sea times. At 1 P. M. the "Nobbies" Point bore per compass W. N. W., distant 5 miles. Light, baffling airs.

Jan. 1, 1855. At 3 A. M. made the "Three Kings," bearing N., distant 10 miles.

Jan. 3. A heavy swell from E. N. E. all this day; proportion of sky clear, $\frac{3}{10}$.

Jan. 4. Noon, proportion of sky clear, $\frac{3}{10}$. 4 A. M., overcast.

Jan. 5. Noon, overcast.

Jan. 6. A heavy swell from S. E., overcast.

Jan. 7. Perfectly calm, with a heavy swell from S. E.; overcast.

Jan. 8. Heavy gales; overcast.

Jan. 9. Increasing gales; very heavy sea. Ship lying-to under a storm staysail. Overcast.

Jan. 11. Blowing a very heavy gale. Ship still lying-to under staysail; the fore-royal blew out of the gaskets. At 7 P. M., shipped a heavy sea, washing away binnacle and both compasses, staving in the after-cabin windows and doors, and disabling two men. At 6 P. M., while putting extra gaskets on the foresail, one of the men was blown from the yards, and fell upon deck, badly hurting himself. Thus we have three hands disabled out of a crew of seven.

Jan. 15. Overcast.

Jan. 16. At 4 P. M. made the island of Marnoons, bearing per compass W. by N., distant about 30 miles. Overcast.

Jan. 20. Overcast.

Jan. 26. Proportion of sky clear, $\frac{3}{10}$.

Jan. 27. Proportion of sky clear, $\frac{3}{10}$. 9 A. M., overcast.

Feb. 2. Proportion of sky clear, $\frac{5}{10}$.

Feb. 4. Overcast.

Feb. 17. At 4 A. M., made the South Farallone, bearing N. W.; distance 3 miles. At 10 A. M., took a pilot. (53 days.)

FROM CALIFORNIA TO CALLAO.

The best route from California to Callao is an interesting subject to almost all vessels in the California trade, for many of them go in ballast from San Francisco to the Chincha Islands for guano. These islands also supply cargoes to many homeward bound Australian traders. But from Australia, the way is plain and the voyage sure; whereas, from California it is difficult and tedious. It is of uncertain duration, and the best route is still undecided.

Many very clever navigators give a decided preference to the eastern passage from California; but while they judge, for the most part, each by his own individual experience, I have the experience of them all to guide me in my judgment. I think it not at all unlikely that the opinion expressed by Capt. Samuel Shreve, of the Cleopatra, may be found, on farther investigation, to hold good for a part of the year. He says:—

"I would advise all captains leaving San Francisco for Callao in the months of August, September, and October, to take the inner passage; that is, being in the long. of 110° west, lat. 8° north, steer along the equator by the wind, passing either side, or between the Galapagos Islands, as the wind will permit. Had I taken this route *instead of crossing the S. E. trades*, it would have shortened my passage one month, which has been proved by the 'West Wind' and several other ships, the above months. I inquired of several disinterested captains as regards the passage to Callao; *all* advised crossing the S. E. trades. It may do when the sun is *far north*. This passage is little understood as yet; and as the *guano* trade has become of so much importance, I feel in duty bound to throw in my mite for future navigators' benefit, and to aid you in your noble pursuit. I had no difficulty with my ship (steady trades) in beating from Callao to the Chincha Islands in three days. What difficulty can exist in beating from the equator to Callao? See what a glorious run I had round the Horn this time homeward. I turned the corners short. I had the S. E. trade very light, and far north, until I reached 7° lat. See westerly currents, &c., and ships I spoke, in my abstract inclosed."

Individual cases may be cited in favor of each route, but upon the whole, and with such lights as I have, I am inclined to give the preference to the western or off-shore route as the one which, for most of the year and on the long run, will give the shortest average passage, and which average, when the route comes to be properly understood and followed, will probably be brought down as low as 50–2 days the year round.

Most vessels on this voyage make a mistake, especially in summer and fall, in the passage across the belt of N. E. trades. Being anxious to get to the east, they edge along, aiming to lose these winds in 90° or 100°, as the case may be. There they encounter the southwardly monsoons that are found at this season of the year between the system of trade winds in the Pacific off the American coast, as they are along the African coast in the Atlantic. The vessels taking this course, and being so baffled, have now

to make a sharp elbow and run off 8° or 10°, or even more degrees, to the westward, before they clear this belt of calms and monsoons and get the S. E. trades. Of course the voyage is greatly prolonged by this.

The route which, as at present advised, I would recommend, is, that navigators steer the same course from California that they would if bound to the United States, until they pass through the S. E. trades and clear the calms of Capricorn. Therefore, I say to the Chincha bound trader, when you get your offing from the "Heads," steer south, aiming to cross the line *not to the east* of 115°, for the rule is, the farther east the harder it is to cross the equatorial doldrums in the Pacific, as well as it is in the Atlantic.

When you get the S. E. trades, crack on with topmast studding-sails set until you get the "brave west winds" on the polar side of the calms of Capricorn. Now turn sharp off from the route around Cape Horn, and run west until you bring your port to bear to the northward of N. E., when you may "stick her away." Now by this rule the China bound navigator may sometimes, before he gets these westerly winds, find himself as far south as 40° or 45°, and as far west as 120° or 125°. Let him not fear, but stand on until he gets the winds that will enable him to steer east, or until he intercepts the route from Australia to Callao, when he may, without fear of not fetching, take that.

In the summer and fall of the northern hemisphere—June to November—the calm belt of Capricorn will be cleared generally on the equatorial side of the parallel of 30° south; at the other seasons, you will have frequently to go 6° or 8° further.

On this voyage, navigators, as soon as they leave the S. E. trades, are often tempted by puffs and "spirts" of westerly winds to stand east; and thus time is lost by running east with a 4 or 5 knot breeze in the calm belt of Capricorn. They should stand south until they clear it, preferring as a rule to take the chances of better winds and the certainty—which is some compensation—of shorter degrees of longitude beyond.

It is scarcely necessary to remark that navigators, in order to understand these routes, so as to profit by them *fully*, must first make themselves acquainted with all that has been said in previous parts of this work about atmospherical circulation, the trade-winds and monsoons at different seasons of the year, the limits of these bands of winds, and the influence of deserts and distant lands upon them. In other words, the navigator who has taken the Charts and Sailing Directions for his guide from Europe or Atlantic America to the Pacific, will necessarily have acquired the information which will enable him properly to understand and rightly to comprehend the Sailing Directions between California, China, Australia, and the various parts of the world mentioned in connection with them. To go south, along the coast of Central America, is very much like going south in the Atlantic along the coast of Africa. The conditions as to winds, calms, and rains, are very much the same; consequently, I should regard it as tedious repetition to go over here, for this part of the route to Callao, all that I have said about the winds, &c., on the route to Rio.

With the assistance of Lieut. Minor, I am enabled to present, for the satisfaction of those interested in the navigation between California and Peru, a table of crossings by the two routes. The eastern route

is the shortest in distance, and therefore, as it might be expected, the quickest runs are to be made now and then by the eastern route. Distance is generally in its favor, and a good run of luc' in getting across the calm belts and in turning corners, will enable a vessel now and then to go very quick. But when that run of luck is to occur, no man can tell; and while the route well fulfils all the conditions of the shortest passage in individual cases, it also fulfils the conditions of the longest on the average.

Captain Knapp, of the Hornet, had such a run of luck, and made the quickest passage that has been made. It will be difficult to make by the western route or to beat it by the eastern; and I quote his abstract for the benefit of those who are disposed to try their luck in the same way.

Ship Hornet (W. Knapp), San Francisco to Callao.

Sept. 4, 1853. Lat. 33° 30′ N.; long. 123° 16′ W. Current, ¼ knot, S. E. Barometer, 29.80; temperature of air, 64°; of water, 63°. Winds: W. N. W., N. W., N. N. W. At 1 P. M., on the bar; cast off steam tug, and made all sail, with light westerly breeze, and flood tide. At 4 P. M., fine breezes, Forolong bearing N. W. by N., distant 25 miles. Middle and latter parts, fine breezes and clear. I intend to take the in-shore route, if practicable on trial.

Sept. 5. Lat. 30° 13′ N.; long. 122° 45′ W. Current, ½ knot, E. by N. Barometer, 29.78; temperature of air, 68°; of water, 68°. Winds: N. N. W., N. N. W., N. by W. Light and moderate breezes and pleasant throughout.

Sept. 6. Lat. 28° N.; long. 121° 21′ W. Barometer, 29.80; temperature of air, 72°; of water, 71°. Wind: N. throughout. Light breezes and pleasant throughout.

Sept. 7. Lat. 26° 14′ N.; long. 119° 54′ W. Barometer, 29.78; temperature of air, 74°; of water, 72°. Wind: N. by W. throughout. Light breezes, and pleasant throughout; smooth sea.

Sept. 8. Lat. 24° 17′ N.; long. 119° 05′ W. Variation observed ½ W. Barometer, 29.75; temperature of air, 74°; of water, 75°. Winds: N. N. W., N. by W., N. by W. Light baffling airs and pleasant throughout; smooth sea.

Sept. 9. Lat. 21° 55′ N.; long. 117° 57′ W. Current, ½ knot, E. Barometer, 29.78; temperature of air, 76°; of water, 78°. Winds: N. W. by N., N. N. W., N. to N. W. Light variables from northward, and pleasant; smooth sea.

Sept. 10. Lat. 19° 57′ N.; long. 116° 58′ W. Barometer, 29.78; temperature of air, 79°; of water, 80°. Winds: N. to N. N. E., N. N. E. to N., N., and variable. Light airs, variable, and hazy; ends pleasant.

Sept. 11. Lat. 18° 44′ N.; long. 116° 28′ W. Barometer, 29.77; temperature of air, 82°; of water, 83°. Winds: N. N. W., N. by W., N. by W. variable. Light variable airs, and calms throughout; S. E. swell.

Sept. 12. Lat. 17° 09′ N.; long. 115° 37′ W. Current, ⅓ knot southwardly. Barometer, 29.78; temperature of air, 83°; of water, 85°. Winds: N. N. W., N. by E., N. E. by N. Light airs and calms; ends light but steady breezes, and pleasant.

Sept. 13. Lat. 15° 24′ N. (D. R.); long. 113° 58′ W. (D. R.). Barometer, 29.68; temperature of air,

84°; of water, 84°. Winds: N. E., N. E., variable, N. N. E. and variable. Commences light breezes; middle part, cloudy, baffling; latter part, squally and baffling, with heavy rain squalls.

Sept. 14. Lat. 13° 57′ N. (D. R.); long. 112° 34′ W. (D. R.). Barometer, 29.65; temperature of air 82°; of water, 86°. Winds: E. N. E. to W. S. W., N. N. E. and variable, W. N. W. and variable. Commences with hard rain squalls and variables; middle and latter parts, variable, calm, with rain.

Sept. 15. Lat. 11° 52′ N.; long. 109° 06′ W. Current, ¼ knot, N. Barometer, 29.60, 29.82; temperature of air, 82°; of water, 86°. Winds: W. S. W. to S. W., W. by S. to S. S. W., S. W. to S. S. W. Commences moderate breezes and squally; at 5 P. M. in studding sails and royals and skysails. Middle part, fresh squalls of wind and rain; in fore and mizzen-topgallant sails. Latter part, moderate, with fresh squalls at intervals; main-topgallant sails set throughout.

Sept. 16. Lat. 10° 02′ N.; long. 106° 12′ W. Current, ½ knot, eastwardly. Barometer, 29.80; temperature of air, 85°; of water, 88°. Winds: southwardly, S. by W., S. W. by S. Commences fresh breezes and squally; middle and latter parts, moderate breezes and fine weather, and baffling throughout, with rough cross sea and strong tide rips.

Sept. 17. Lat. 8° 06′ N. (D. R.); long. 104° 10′ W. (D. R.). Barometer, 29.80; temperature of air, 80°; of water, 82°. Winds: S. W., S. W. and variable, S. W. and variable. Commences moderate breezes and pleasant weather; set studding-sails; middle and latter parts, cloudy and rainy, and variable throughout; southerly swell and tide rips.

Sept. 18. Lat. 7° 02′ N.; long. 101° 10′ W. (Indifferent observation.) Current, 48 miles, E. N. E., in 48 hours. Barometer, 29.76; temperature of air, 81°; of water, 82°. Winds: S. S. W., S. by W., S. by W. and S. First and middle parts, moderate breezes and much rain, royals in; latter part, squally, southerly sea with strong tide rips and indication of currents.

Sept. 19. Lat. 5° 44′ N.; long. 98° W. (Indifferent observation.) Current, 1 knot, N. E. by E. Barometer, 29.77; temperature of air, 78°; of water, 82°. Winds: S., S. by W., S. Moderate breezes and baffling; cloudy and squally throughout.

Sept. 20. Lat. 04° 9′ N.; long. 94° 19′ W. (Indifferent observation.) Current, ¼ knot, N. E. Barometer, 29.80; temperature of air, 74°; of water, 80°. Winds: S. by W., S., S. Fresh breezes, with frequent squalls throughout; head sea, royals *in*.

Sept. 21. Lat. 3° 11′ N.; long. 90° 56′ W. Current, ¼ knot, N. E. Barometer, 29.80; temperature of air, 76°; of water, 80°. Winds: S. by E., S., S. by E. First and middle parts, moderate breezes with light rain squalls; latter part, moderate with passing clouds; all light sails set by the wind.

Sept. 22. Lat. 2° 22′ N.; long. 87° 32′ W. Current, 1 knot, north. Barometer, 29.80; temperature of air, 76°; of water, 80°. Winds: S. by E., S., S. by E. Moderate and baffling breezes throughout, with rain squalls; at 8 P. M., in skysails.

Sept. 23. Lat. 1° 28′ N.; long. 84° 24′ W. Current, 1 knot, N. E. by N. Barometer, 29.77; temperature of air, 75°; of water, 79°. Winds: S. S. E. to S. by E., S., S. Moderate breezes, baffling, with light rain squalls throughout; all studding-sails set.

Sept. 24. Lat. 0° 28′ S.; long. 81° 57′ W. Current, ¾ knot, N. N. W. Barometer, 29.80; temperature of air, 72°; of water, 74°. Winds: S., S. by W. to S. S. W., S. by W. Moderate and baffling breezes S. to S. S. W., with light rain squalls throughout. Twenty days to the equator in long. 82° west.

Sept. 25. Lat. 2° 1′ S.; long. 81° 05′ W. Current, ½ knot, S. E. Barometer, 29.80; temperature of air, 68°; of water, 76°. Winds: S. by W. throughout. Moderate and baffling winds from S. to S. S. W., with clouds throughout. At 8 P. M. tacked to the westward; at 4 A. M. tacked to S. E.; at meridian, made Point St. Eleana, Gulf of Guayaquil, E. by S., distant 12 miles. 21 days and 22 hours from San Francisco bar.

Sept. 26. Lat. 3° 36′ S.; long. 80° 50′ W. Current, 1 knot, E. N. E. Barometer, 29.70, 29.80; temperature of air, 64°; of water, 62°. Winds: S. W. by S., S. W. by S., S. S. W. and variable. Fresh breezes and variable, with strong sea breezes. At 1 P. M., Point St. Eleana E. by N.; at 8 P. M. tacked to westward; at 4 P. M. tacked to S. E. At meridian, Point de Sal bore south, 15 miles; Point Picoz E. by N. 10 miles.

Sept. 27. Lat. 4° 51′ S.; long. 82° 44′ W. Current, ½ knot, N. E. Barometer, 29.80; temperature of air, 62°; of water, 62°. Winds: S. W, variable, S. W. to S. S. E., S. S. E. Moderate breezes, and very baffling throughout; ship tacking to windward to best advantage; P. M., passed two coasters working to windward. At 6 P. M., Cape Blanco or White Cape bearing S. by W., distant 12 miles; tacked to westward; observed many schools of whales and blackfish.

Sept. 28. Lat. 6° 15′ S.; long. 83° 43′ W. Current, ½ knot, northwardly. Barometer, 29.80; temperature of air, 66°; of water, 67°. Winds: S. S. E., S. S. E., S. E. by S. Light breezes and hazy weather; tacked ship as occasion required; southerly swell; winds baffling; noticed sperm whales, porpoises, albatrosses, &c.

Sept. 29. Lat. 7° 16′ S.; long. 83° 20′ W. Current, ¾ knot northwestwardly. Barometer, 29.80; temperature of air, 69°; of water, 66°. Winds: S. S. E. throughout. Light and variable winds throughout, with hazy weather and passing clouds; noticed two schools of whales; tacked and stood to eastward fourteen hours.

Sept. 30. Lat. 8° 34′ S.; long. 83° 17′ W. Current, ¾ knot N. N. W. Barometer, 29.83; temperature of air, 66°; of water, 66°. Winds: S. S. E., S. E. by S., S. E. Moderate breezes and passing clouds throughout. At 9 P. M. tacked to westward; noticed whales, blackfish, albatrosses, &c.

Oct. 1. Lat. 11° 30′ S.; long. 84° 41′ W. Current, ¾ knot, N. W. Barometer, 29.86; temperature of air, 67°; of water, 67°. Winds: S. E., S. E. by E., S. E. by E. and S. E. by E. ½ E. First part, breezes and head sea, and squally; middle and latter parts, squally; in skysails; light rain squalls, with head sea.

Oct. 2. Lat. 14° 32′ S.; long. 85° 38′ W. Current, ¾ knot, N. W. Barometer, 29.90; temperature of air, 66°; of water, 67°. Winds: S. E. by E., E. S. E., E. S. E. Fresh breezes and squally throughout, with light rain; middle part, royals furled; head sea.

Oct. 3. Lat. 13° 45′ S. (D. R.); long. 83° 27′ W. (D. R.). Barometer, 29.85; temperature of air, 66°;

of water, 65°. Winds: E. S. E., S. E. by E., S. E. by E. Moderate breezes and cloudy throughout; middle and latter parts, baffling. At 5 P. M., tacked to N. E.; 29 days 4 hours from San Francisco. Judge myself far enough to southward to lay up for Callao with the regular trades.

Oct. 4. Lat. 12° 11′ S.; long. 80° 37′ W. Current, 40 miles N. W. in last 48 hours. Barometer, 29.83; temperature of air, 65°; of water, 67°. Wind: S. E. by E. throughout. Moderate breezes and cloudy weather; all sail set to the wind.

Oct. 5. Lat. 11° 52′ S.; long. 79° W. Current, ½ knot, N. W. Barometer, 29.12; temperature of air, 65°; of water, 64°. Wind: S. E. throughout. Moderate baffling winds, calms, &c.; cloudy throughout; water discolored; tacked six hours to S. W.

Oct. 6. Lat. 11° 40′ S.; long. 77° 53′ W. Current, 1 knot, N. W. Barometer, 29.80; temperature of air, 65°; of water, 64°. Winds: S. E. by S., S. E. ½ S., S. E. Light breezes and cloudy throughout; tacked to S. W. eight hours.

Oct. 7. Lat. 12° S.; long. 77° 30′ W. Barometer, 29.80. Winds: S. E. by S. and calm, S. E. by S., S. E. by S. and calm. Light airs and calms throughout. At 4 P. M., tacked ship eight miles north of Callao; at meridian, San Lorenzo bore E. by S. five miles; ends calm. At 4 P. M. anchored in Callao Roads; 34 days from anchorage to anchorage, viz: from San Francisco to Callao.

The passage of 48 hours from Callao to the Chincha Islands, being of a uniform nature, I omitted recording particulars, and have but one remark to make from the little experience I have on this coast: that is, to keep out of the influence of the land breezes, and calms appertaining; preferring the trades off shore, and more steady breezes, to being delayed in vain, by baffling airs and calms in shore, for at least twelve out of the twenty-four hours per day; as I am of the opinion that the land breezes cannot be depended upon, on this coast, in the autumnal months at least. In working clear from Callao to the Chinchas, I made but one tack, standing off 26 hours and in 22 hours, which brought me up with San Gallon, 15 miles to windward of the Chinchas, in 48 hours from Callao. The same rule I have observed in working down from Cape Blanco to Callao, that is, to keep a few degrees off shore, say, three or four, in preference to being becalmed in shore half of the time, which was my case while working from Point St. Eleana down to Cape Blanco.

In preferring the in-shore route, and shortening my passage from California to Callao, I feel indebted to Lieut. Maury, for his remarks upon a system of S. W. monsoons, between the limits of the coast winds of Central America and Lower California, and the eastern limits of the N. E. trades, similar to that experienced in the North Atlantic, near the equator, and to the westward of the doldrums. This opinion of Lieut. Maury appeared reasonable enough to induce me to make the trial, and having only 20 days to the equator in long. 82° W., consequently, have no reason to regret the experiment, believing it shortened my passage ten to fifteen days; and if again bound, in a sharp ship, during the months of August, September, October, and November, from California to the coast of Peru, I should again try it.

Very respectfully yours,

W. KNAPP.

I treat the routes on the average. Perhaps when log-books shall be received in sufficient numbers, the eastern route may prove the best at certain seasons; but now, those who take the western route appear to have in their favor, the year round, an average of about nine per cent. of time. But it has not been at all understood or properly followed, and, I think that the results to be obtained in the course of the next year or two after these remarks meet the eye of navigators, will exhibit a more decided contrast, than that between 58 and 63 days, for these are the averages shown by such data as I have, and are herewith exhibited.

FROM CALIFORNIA

Names of Vessels; Crossings in the Pacific south of the Equator; and Length

NAME OF VESSEL.	Days from California to the equator.	Date of crossing the equator.	LONGITUDE OF CROSSING PARALLELS OF— 0°.	10° S.	15° S.	20° S.	25° S.	30° S.	35° S.
			Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.
JANUARY.									
Western Passages—									
Firebrand	32	Jan. 8, 1851	114.0	117.0	117.0	117.0	115.0		
Hurricane	18	" 19, 1854	118.0	123.0	123.0	123.0	121.0	116.0	114.0
Hero	20	" 7, "	114.0	119.0	119.0	121.0	115.0	110.0	105.0
North Wind	19	" 17, "	118.0	122.0	122.0	122.0	121.0	117.0	
Sabine	21	" 1, "	116.0	120.0	122.0	121.0	120.0	112.0	
Winfield Scott	19	" 10, "	113.0	120.0	119.0	120.0	116.0	112.0	106.0
Sunbeam	20	" 10, "	116.0	122.0	122.0	121.0	117.0	112.0	107.0
Means of western passages	21.3		115.6	120.4	120.6	120.7	117.8	113.1	108.0
Eastern Passages—									
E. C. Sronton	43	Jan. 5, 1854	93.0						
Sandusky	40	" 9, "	94.0						
Means of eastern passages	41.5		93.5						
FEBRUARY.									
Western Passages—									
Arcole	27	Feb. 27, 1853	98.0	105.0	106.0	105.0			
Comet	12	" 24, "	122.0	124.0	124.0	123.0	122.0	121.0	108.0
Flying Dutchman . . .	12	" 23, "	119.0	123.0	124.0	124.0	124.0	121.0	108.0
Arab	21	" 7, 1854	115.0	116.0	116.0	116.0	115.0	110.0	102.0
Boston	24	" 13, "	106.0	113.0	114.0	115.0	113.0	112.0	
Wisconsin	17	" 5, "	121.0	125.0	123.0	122.0	120.0	116.0	94.0
Means of western passages	18.8		113.5	117.6	117.8	117.5	118.8	116.0	103.0
MARCH.									
Western Passages—									
Boston	23	Mar. 23, 1850	113.0	116.0	117.0	117.0	119.0	113.0	
Senator	17	" 7, 1853	109.0	114.0	114.0	114.0	113.0		
Wessacumcon	24	" 4, "	114.0	121.0	124.0	123.0	123.0	128.0	119.0
Bald Eagle	12	" 13, 1854	114.0	119.0	120.0	121.0	121.0	119.0	120.0
Indianola	12	" 8, "	112.0	117.0	120.0	120.0	119.0	109.0	
Morning Light	12	" 8, "	109.0	115.0	117.0	117.0	116.0	110.0	104.0
Means of western passages	16.6		111.8	117.0	118.6	118.8	118.5	115.8	114.3

TO CALLAO.

of Passages to the Equator and to Callao—arranged according to the Month.

NAME OF VESSEL.	Days from equator to highest S. lat.	LATITUDE OF CROSSING MERIDIANS OF—									Days from California to Callao.
		125° W.	115° W.	110° W.	105° W.	100° W.	95° W.	90° W.	85° W.	80° W.	
		Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	
JANUARY.											
Western Passages—											
Firebrand	12			25.0	25.0	24.0	23.0	18.0	14.0	12.0	75
Hurricane	15			37.0							
Hero	13	22.0	25.0	31.0	35.0	35.0	34.0	30.0	22.0	17.0	55
North Wind	17		31.0	34.0	34.0	35.0	36.0	35.0	31.0	24.0	48
Sabine	18	15.0	30.0	31.0	32.0	32.0	31.0	28.0	23.0	20.0	54
Winfield Scott	16		26.0	33.0	36.0	35.0	35.0	34.0	26.0	17.0	47
Sunbeam	14		27.0	33.0	34.0	33.0	29.0	28.0	21.0	15.0	56
Means of western passages	15	18.5	27.8	32.0	32.6	32.3	31.3	28.8	22.8	17.5	55.8
Eastern Passages—											
E. C. Sronton											79
Sandusk											84
Means of eastern passages											81.5
FEBRUARY.											
Western Passages—											
Arcole	11				17.0	23.0	22.0	19.0	15.0	13.0	57
Comet	13				43.0						
Flying Dutchman	12				40.0						
Arab	20		25.0	30.0	33.0	35.0	36.0	35.0	31.0	26.0	52
Boston	15		21.0	33.0	31.0	31.0	31.0	32.0	28.0	17.0	65
Wisconsin	25		31.0	32.0	34.0	34.0	35.0	34.0	26.0	22.0	55
Means of western passages	16		25.6	31.7	33.0	30.7	31.0	30.0	25.0	19.5	57.2
MARCH.											
Western Passages—											
Boston	16		28.0	30.0	30.0	28.0	25.0	22.0	21.0	17.0	63
Senator	15		14.0	25.0	26.0	26.0	24.0	22.0	16.0	14.0	49
Wessacumcon	15	27.0	35.0	34.0	34.0	35.0	35.0	34.0	27.0	31.0	78
Bald Eagle	13	43.0									
Indianola	23		28.0	29.0	31.0	32.0	33.0	31.0	26.0	21.0	47
Morning Light	18		27.0	30.0	34.0	33.0	33.0	33.0	33.0	32.0	46
Means of western passages	15	35.0	26.4	29.6	31.0	30.8	30.0	28.4	24.6	23.0	56.6

FROM CALIFORNIA

Names of Vessels; Crossings in the Pacific south of the Equator; and Length of

NAME OF VESSEL.	Days from California to the equator.	Date of crossing the equator.	LONGITUDE OF CROSSING PARALLELS OF—						
			0°.	10° S.	15° S.	20° S.	25° S.	30° S.	35° S.
			Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.
APRIL.									
Western Passages—									
Salem	25	Apr. 14, 1853	113.0	119.0	119.0	119.0	118.0	117.0	
Capitol	24	" 18, "	117.0	121.0	123.0	124.0	125.0	126.0	116.0
Samuel Lawrence . . .	30	" 20, 1854	107.0	109.0	111.0	110.0	103.0		
Morning Light	23	" 2, "	110.0	113.0	115.0	115.0	112.0		
Means of western passages	25.5		111.7	115.5	117.0	117.0	114.5		
Eastern Passage—									
Arthur	22	Apr. 20, 1854							
Means of eastern passage	22								
MAY.									
Western Passage—									
Manchester	26	May 30, 1853	123.0	125.0	125.0	125.0	107.0		
Means of western passage	26		123.0	125.0	125.0	125.0	107.0		
Eastern Passages—									
Gray Feather	28	May 2, 1853	81.0						
Helen McGaw	29	" 26, "	83.0						
Realm	36	" 26, "	91.0						
Means of eastern passages	31		85.0						
JUNE.									
Western Passages—									
Golden Eagle	19	June 27, 1853	103.0	106.0	108.0	109.0	101.0		
Kentucky	26	" 7, "	103.0	107.0	107.0	110.0	106.0		
Means of western passages	22.5		103.0	106.5	107.5	109.5	103.5		
Eastern Passages—									
Danube	27	June 2, 1853	81.0						
Hannah Thornton . . .	35	" 1, "	82.0						
Adelaide	32	" 16, "	84.0						
Means of eastern passages	31.3		82.3						

TO CALLAO.

Passages to the Equator and to Callao—arranged according to the Month—Continued.

NAME OF VESSEL.	Days from equator to highest S. lat.	LATITUDE OF CROSSING MERIDIANS OF—									Days from California to Callao.
		125° W.	115° W.	110° W.	105° W.	100° W.	95° W.	90° W.	85° W.	80° W.	
		Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	
APRIL.											
Western Passages—											
Salem	15			32.0	32.0	32.0	31.0	31.0	28.0	20.0	53
Capitol	12	29.0	35.0	36.0	35.0	34.0	31.0	29.0	27.0	21.0	54
Samuel Lawrence	23				23.0	26.0	27.0	27.0	25.0	20.0	61
Morning Light	12		20.0	27.0	28.0	28.0	28.0	27.0	25.0	19.0	51
Means of western passages	15.5	29.0	27.5	31.6	29.5	30.0	29.2	28.5	26.2	20.0	54.7
Eastern Passage—											
Arthur											89
Means of eastern passage											89
MAY.											
Western Passage—											
Manchester	15	17.0	21.0	21.0	26.0	28.0	28.0	27.0	26.0	19.0	61
Means of western passage	15	17.0	21.0	21.0	26.0	28.0	28.0	27.0	26.0	19.0	61
Eastern Passages—											
Gray Feather											58
Helen McGaw											70
Realm											70
Means of eastern passages											66
JUNE.											
Western Passages—											
Golden Eagle	10				24.0	25.0	27.0	27.0	26.0	18.0	43
Kentucky	16			22.0	26.0	27.0	27.0	26.0	23.0	17.0	58
Means of western passages	13			22.0	25.0	26.0	27.0	26.5	24.5	17.5	50.5
Eastern Passages—											
Danube											49
Hannah Thornton											77
Adelaide											61
Means of eastern passages											62.3

FROM CALIFORNIA

Names of Vessels; Crossings in the Pacific south of the Equator; and Length of

NAME OF VESSEL.	Days from California to the equator.	Date of crossing the equator.	LONGITUDE OF CROSSING PARALLELS OF— 0°.	10° S.	15° S.	20° S.	25° S.	30° S.	35° S.
			Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.
JULY.									
Western Passages—									
Golden Racer	27	July 20, 1853	98.0	107.0	108.0	109.0	111.0	103.0	
Esther May	24	" 10, "	111.0	114.0	117.0	117.0	116.0	114.0	101.0
Huguenot	23	" 1, "	112.0	119.0	118.0	94.0	89.0		
Princess Alice	30	" 3, "	112.0	117.0	109.0	110.0	110.0		
Lucknow	24	" 19, "	103.0	109.0	110.0	110.0	111.0	103.0	86.0
Harriet	26	" 4, 1854	98.0	103.0	105.0	104.0	105.0	104.0	
Means of western passages	25.6		105.7	111.5	111.2	107.3	107.0	106.0	93.5
Eastern Passages—									
Lucy Elizabeth	30	July 26, 1853	98.0						
Simoom	27	" 16, "	85.0						
Alhesdrough	30	" 14, "	81.0						
Means of eastern passages	29		88.0						
AUGUST.									
Western Passages—									
Alert	30	Aug. 2, 1853	109.0	114.0	114.0	115.0	115.0	112.0	93.0
Parthian	26	" 31, "	107.0	112.0	111.0	111.0	110.0	110.0	
New York	25	" 27, "	110.0	114.0	116.0	116.0	109.0		
Governor Morton . . .	26	" 3, "	118.0	120.0	121.0	122.0	121.0	102.0	
A. F. Jenness*	37	" 27, "	96.0	104.0	105.0	107.0	107.0	110.0	
Golden Eagle	21	" 27, 1854	111.0	115.0	114.0	113.0	109.0		
Means of western passages	25.6		111.0	115.0	115.2	115.4	112.8	108.0	93.0
Eastern Passage—									
Magnolia	33	Aug. 16, 1854	83.0						
Means of eastern passage	33		83.0						
SEPTEMBER.									
Western Passages—									
Wallace†	30	Sept. 11, 1853	86.0	86.0	88.0	88.0	90.0	85.0	
Sirocco	26	" 2, "	103.0	108.0	109.0	108.0	112.0	114.0	106.0
Empress of the Seas . .	24	" 16, "	115.0	119.0	120.0	121.0	120.0	120.0	
Climax	21	" 2, "	108.0	115.0	116.0	117.0	119.0	120.0	115.0
Roscoe	28	" 30, "	112.0	115.0	117.0	120.0	120.0		
Albers	27	" 26, "	104.0	107.0	108.0	106.0	105.0		
Means of western passages	25.2		108.4	112.8	114.0	114.4	115.2	118.0	110.5
Eastern Passages—									
Hornet	20	Sept. 24, 1853	82.0						
C. L. Bevan	26	" 12, "	87.0						
Means of eastern passages	23		84.5						

* Not included in the average.

† Old and leaky; not included in the average.

TO CALLAO.

Passages to the Equator and to Callao—arranged according to the Month—Continued.

NAME OF VESSEL.	Days from equator to highest S. lat.	LATITUDE OF CROSSING MERIDIANS OF— 125° W.	115° W.	110° W.	105° W.	100° W.	95° W.	90° W.	85° W.	80° W.	Days from California to Callao.
		Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	
JULY.											
Western Passages—											
Golden Racer	14			22.0	29.0	31.0	31.0	32.0	30.0	24.0	53
Esther May	14		28.0	32.0	35.0	35.0	37.0	38.0	32.0	26.0	60
Huguenot	11		18.0	21.0	20.0	20.0	20.0	24.0	24.0	16.0	48
Princess Alice	10		14.0	21.0	28.0	28.0	29.0	27.0	24.0	18.0	74
Lucknow	14			28.0	31.0	32.0	32.0	33.0	35.0	25.0	51
Harriet	14				26.0	27.0	24.0	23.0	27.0	24.0	56
Means of western passages	13		20.0	25.8	28.1	28.8	29.0	29.5	28.7	22.1	57
Eastern Passages—											
Lucy Elizabeth											37
Simoom											46
Alhesdrough											60
Means of eastern passages											48
AUGUST.											
Western Passages—											
Alert	11		27.0	32.0	32.0	32.0	33.0	35.0	33.0	28.0	66
Parthian	12			29.0	28.0	29.0	31.0	24.0	20.0	17.0	58
New York	10		21.0	26.0	26.0	27.0	28.0	28.0	27.0	25.0	56
Governor Morton	11		29.0	29.0	30.0	29.0	19.0	28.0	27.0	20.0	68
A. F. Jenness*	18			30.0	30.0	33.0	34.0	33.0	33.0	28.0	84
Golden Eagle	13		13.0	24.0	27.0	28.0	28.0	27.0	22.0	15.0	40
Means of western passages	11.4		22.5	28.0	28.6	29.0	28.0	28.4	25.8	21.0	57.6
Eastern Passage—											
Magnolia											57
Means of eastern passages											57
SEPTEMBER.											
Western Passages—											
Wallace†	21							26.0	30.0	29.0	75
Sirocco	13		33.0	33.0	34.0	34.0	33.0	32.0	28.0	19.0	60
Empress of the Seas	9		33.0	33.0	32.0	31.0	29.0	29.0	23.0	18.0	48
Climax	14		35.0	34.0	35.0	34.0	33.0	31.0	28.0	21.0	60
Roscoe	13		28.0	29.0	29.0	27.0	26.0	24.0	20.0	14.0	61
Albers	27				16.0	21.0	23.0	23.0	21.0	17.0	65
Means of western passages	15.2		32.2	32.2	32.5	31.5	30.2	27.5	24.0	17.8	58.8
Eastern Passages—											
Hornet											34
L. C. Bevan											63
Means of eastern passages											48.5

* Not included in the average.

† Old and leaky; not included in the average.

FROM CALIFORNIA

Names of Vessels; Crossings in the Pacific south of the Equator; and Length of

NAME OF VESSEL.	Days from California to the equator.	Date of crossing the equator.	LONGITUDE OF CROSSING PARALLELS OF—						
			0°.	10° S.	15° S.	20° S.	25° S.	30° S.	35° S.
			Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.	Long. W.
OCTOBER.									
Western Passage—									
Cleopatra	27	Oct. 23, 1853	117.0	123.0	125.0	128.0	127.0	124.0	122.0
Means of western passage	27		117.0	123.0	125.0	128.0	127.0	124.0	122.0
Eastern Passages—									
Chenango	31	Oct. 12, 1850	81.0						
Amazon	30	" 27, 1853	82.0						
Robert Harding	32	" 2, "	80.0						
Flying Eagle	23	" 1, "	81.0						
Mary Annah	25	" 27, "	85.0						
Means of eastern passages	28.2		81.8						
NOVEMBER.									
Western Passages—									
Louisa Bliss*	42	Nov. 4, 1850	80.0	98.0	101.0	104.0	104.0	101.0	
Queen of Clippers . . .	28	" 28, 1853	102.0	106.0	107.0	107.0	108.0	107.0	89.0
Belle of the West . . .	26	" 22, "	105.0	107.0	107.0	104.0	103.0	101.0	
Mary Spring	25	" 3, "	108.0	112.0	112.0	112.0	112.0	102.0	
Atalanta	28	" 25, "	111.0	115.0	115.0	117.0	118.0	118.0	111.0
Means of western passages	26.7		106.5	110.0	110.2	110.0	110.2	107.0	100.0
Eastern Passages—									
Levanter	29	Nov. 15, 1853	81.0						
J. H. Shepherd	33	" 15, "	81.0						
West Wind	30	" 15, "	82.0						
Avondale	29	" 17, "	104.0						
Means of eastern passages	30.2		87.0						
DECEMBER.									
Western Passages—									
Wild Ranger	20	Dec. 2, 1853	107.0	111.0	110.0	110.0	109.0	203.0	
White Swallow	26	" 8, "	104.0	110.0	110.0	110.0	109.0	102.0	
Western Star	21	" 27, "	104.0	112.0	113.0	114.0	113.0	110.0	107.0
Reindeer	23	" 2, "	115.0	118.0	118.0	118.0	115.0	105.0	94.0
Corinne	25	" 26, "	110.0	116.0	117.0	119.0	118.0	112.0	95.0
Greenwich†	31	" 3, "	105.0	113.0	113.0	114.0	114.0	106.0	95.0
Windward	23	" 16, "	113.0	117.0	116.0	117.0	117.0	109.0	
Means of western passages	23		109.0	114.0	114.0	114.7	113.5	106.8	

* Attempted the eastern passage first; not included in the average.

† Not included in the means.

TO CALLAO.

Passages to the Equator and to Callao—arranged according to the Month—Continued.

NAME OF VESSEL.	Days from equator to highest S. lat.	LATITUDE OF CROSSING MERIDIANS OF—									Days from California to Callao.
		125° W.	115° W.	110° W.	105° W.	100° W.	95° W.	90° W.	85° W.	80° W.	
		Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	Lat. S.	
OCTOBER.											
Western Passage—											
Cleopatra	17	30.0	41.0	39.0	39.0	40.0	39.0	38.0	33.0	31.0	71
Means of western passage	17	30.0	41.0	39.0	39.0	40.0	39.0	38.0	33.0	31.0	71
Eastern Passages—											
Chenango											59
Amazon											65
Robert Harding											56
Flying Eagle											44
Mary Annah											61
Means of eastern passages											57
NOVEMBER.											
Western Passages—											
Louisa Bliss*	18				27.0	31.0	33.0	32.0	32.0	31.0	87
Queen of Clippers	12				32.0	33.0	34.0	35.0	30.0	24.0	58
Belle of the West	17				29.0	31.0	32.0	30.0	23.0	16.0	54
Mary Spring	12			26.0	29.0	30.0	24.0	19.0	13.0	10.0	57
Atalanta	15		32.0	35.0	35.0	34.0	34.0	33.0	32.0	23.0	53
Means of western passages	14		32.0	30.5	31.2	32.0	31.0	29.2	24.5	18.2	55.5
Eastern Passages—											
Levanter											49
J. H. Shepherd											62
West Wind											51
Avondale											60
Means of eastern passages											55.5
DECEMBER.											
Western Passages—											
Wild Ranger	12			24.0	29.0	31.0	31.0	27.0	23.0	17.0	48
White Swallow	13				29.0	30.0	25.0	18.0	14.0	13.0	51
Western Star	15		23.0	31.0	35.0	36.0	36.0	36.0	29.0	24.0	52
Reindeer	27		26.0	28.0	30.0	30.0	34.0	36.0	33.0	27.0	69
Corinne	18		28.0	32.0	34.0	35.0	35.0	31.0	24.0	19.0	61
Greenwich†	25		22.0	29.0	31.0	31.0	34.0	35.0	32.0	28.0	71
Windward	18		28.0	30.0	32.0	22.0	22.0	16.0	13.0		60
Means of western passages	17.1		26.2	30.2	31.5	30.7	30.5	27.3	24.3	20.0	56.8

* Attempted the eastern passage first; not included in the average.

† Not included in the means.

JAPAN EXPEDITION.

The ports of Japan have been opened for such a short time, that the port regulations, established through Commodore Perry, are quite as important to the trader as Sailing Directions. I therefore give such of them as have been received.

Sailing Directions for Yedo. By Lieut. Wm. L. Maury, U. S. Navy.

[*Japan Expedition Press.*]

U. S. Steam Frigate Mississippi, Hong-Kong, *September* 4, 1854.

Vessels from the southward, bound to this bay, should pass up to the westward of the chain of islands lying off the Gulf of Yedo, and are cautioned against mistaking the deep bight of Kawatsu Bay for the entrance of Uraga Channel; for, on the N. E. side of this bay, there is a ledge of rocks several miles from the shore, bearing from Cape Sagami about W. N. W. distant ten miles, upon which one of the vessels of our squadron grounded. A stranger without a correct chart would naturally make this mistake, as the opening of the channel is not seen at a distance from this quarter, the shore appearing as an unbroken line.

The entrance to the channel bears from the centre of Oho Sima N. E. by N. distant about twenty miles. Stand in upon this line, and the Saddle Hill to the northward of Cape Sagami will be readily recognized, as well as the round black knob on the eastern side of the channel. On approaching Uraga, the Plymouth Rocks will be plainly seen; give these a berth of half a mile to clear the Ingersoll Patch, a sunken rock with but one fathom on it, and which is the only known danger in the channel.

Between Plymouth Rocks and Cape Kami Saki, the ground is clear, and the anchorage good, if care be taken to get pretty well in, so as to avoid the strong tides which sweep round the latter with great rapidity. A spit makes out a short distance to the southward of Kami Saki, but to the northward of the cape the shore is bold and the water very deep.

On rounding Cape Kami Saki, if bound for the city of Yedo, steer N. W. by N. until Perry Island bears S. by W. ¾ W. so as to clear Saratoga Spit, which extends well out from the eastern shore; then haul up, keeping Perry Island upon this bearing, until the beacon on the low point to the southward of Yedo, bears W. N. W. This clears the shoal off the point, and here there is good anchorage in about ten fathoms water, in full view of the city of Yedo.

At this point our survey terminated; the boats, however, found a clear channel, with plenty of water for the largest vessels, several miles further to the northward, and within a few miles of the city.

If bound to the American anchorage, from Cape Kami Saki steer N. W., and anchor in 8 or 10 fathoms water, with Perry Island bearing S. S. E., and Webster Island S. W. by S.

To the southward of Webster Island there is also good anchorage in 6 and 7 fathoms. Near this anchorage there are two snug coves, very accessible, in which vessels may conveniently repair and refit.

Susquehanna Bay, three miles W. N. W. from Cape Kami Saki, is well sheltered, but it contains a number of reefs and rocks, and is, therefore, not recommended as an anchorage.

Mississippi Bay is four miles north of the American anchorage; it is well sheltered from the prevailing winds. Upon anchoring, it is necessary to give the shore a good berth, to avoid a shoal which extends out from a half to three-quarters of a mile. The conspicuous headland, or long yellow bluff on the north side of this bay is called Treaty Point; a shoal surrounds the point from two-thirds of a mile to a mile distant.

Between the American anchorage and Treaty Point the soundings are irregular, shoaling suddenly from 12 to 5 fathoms on a bank of hard sand.

To the northward of Treaty Point, and N. N. W. from Cape Kami Saki, distant 14 miles, is Yokohama Bay. To reach this anchorage, bring the wooded bluff which terminates the high land on the north side of the Bay to bear N. by W. ½ W., and steer for it until Treaty Point bears S. W. by S.; this clears the spit off the point; then haul up about N. W. by N. for the bluff over the town of Kanagawa, and anchor in 5 1-2 or 6 fathoms, with the Haycock just open to the eastward of Mandarin Bluff. Mandarin is the steep bluff a mile to the northward of Treaty Point.

A flat extends out from the northern shore of this bay, between Kanagawa and Beacon Point, from one to two miles; off Mandarin Bluff there is also a shoal extending a mile to the northward.

The Bay of Yedo is about 12 miles wide, and thirty deep, with excellent holding ground, and capable of sheltering the fleets of the world.

Our survey embraced the western shore only, from Cape Kami Saki to Beacon Point. We had no opportunity of examining the eastern side. The soundings from Treaty Point across, in an E. S. E. direction are regular, and 3 fathoms were found about a mile and a half from the opposite shore.

Of Uraga Channel, a reconnoissance was made of the western shore only.

During our stay in the bay, from the 17th of February to the 18th of April, the weather was generally fine, being occasionally interrupted by strong winds and heavy rain. The gales came up suddenly from the southward and westward with a low barometer, and continued for a short time, when the wind hauled round to the northward and westward, and moderated. We had no easterly blows; in fact, the wind was rarely from this quarter, except when hauling round from the northward (as it invariably did) by east to the southward and westward.

The tide is quite strong out in the bay; and off the tail of Saratoga Spit, Perry Island, and Cape Kami Saki, its velocity is much increased. But at the anchorage in the Bay of Yokohama it was scarcely felt. At Yokohama, the Japanese authorities supplied us with wood and water, and a few vegetables, fowls, eggs, oysters and clams.

Latitude of Cape Sagami,	35° 06′ 30″
Longitude " "	139° 40′ 00″
Latitude of Webster Island	35° 18′ 30″
Longitude " "	139° 40′ 34″

Latitude of Treaty Building, north end of Yokohama . . .	35° 26′ 44″
Longitude " " " " "	139° 40′ 23″
Variation	25′ Westerly.
High water F. and C.	VI.
Rise and fall at Yokohama	6 ft.

By order of Commodore M. C. PERRY.

SILAS BENT,

Flag Lieutenant.

SAILING DIRECTIONS FOR THE HARBOR OF SIMODA. BY LIEUT. WM. L. MAURY, U. S. N.

U. S. STEAM FRIGATE MISSISSIPPI, HONOLULU, *October* 26, 1854.

Vessels bound to the harbor of Simoda, from the southward and westward, should make Cape Idzu, from which Rock Island bears E. S. E. ¼ E., distant about 5 miles; and if the weather is at all clear, the chain of islands at the entrance of the Gulf of Yedo will at the same time be plainly visible.

Between Rock Island and the main land there are a number of rocks awash and above water, among which the Japanese junks freely pass; but a ship should not attempt a passage inside of Rock Island, unless in case of urgent necessity, particularly as the northeasterly current, which sweeps along this coast, seems to be, at this point, capricious, both in direction and velocity.

Giving Rock Island a berth of a mile, the harbor of Simoda will be in full view, bearing N. ½ W., distant 5 miles.

Vandalia Bluff, on the east side of the entrance, may be recognized by a grove of pine trees on the summit of the bluff, and the village of Susaski, which lies about one-third of the way between it and Cape Diamond. Cape Diamond is a sharp point, making out to the eastward of the entrance of the harbor.

Standing in from Rock Island, you will probably pass through a number of tide rips, but not get soundings with the hand-lead until near the entrance of the harbor, when you will be in from 14 to 27 fathoms.

Should the wind be from the northward and fresh, a vessel should anchor at the mouth of the harbor until it lulls or shifts, or until she can conveniently warp in, as it is usually flawy and always baffling.

Approaching from the northward and eastward, a vessel can pass on either side of Oho Sima, from the centre of which Cape Diamond bears W. S. W. ¾ W., distant about 20 miles.

Between Oho Sima and Simoda no dangers are known to exist; but the northeasterly current must be borne constantly in mind, particularly at night and in thick weather. Its general strength is from two to three miles per hour; but as this, as well as its direction, is much influenced by the local winds, headlands, islands, &c., neither can be relied upon.

Should Oho Sima be obscured by thick weather, before reaching Cape Diamond, endeavor to sight

Rock Island, for there are no very conspicuous objects on the main land by which a stranger can recognize the harbor at a distance, and the shore appears as one unbroken line.

To the westward of the harbor there are several sand beaches, and three or four sand banks. These can be plainly discerned when within six or eight miles, and are good landmarks.

A vessel from the southward and eastward should pass to the westward of the Island of Kozu Sima,* which may be known by a remarkable snow-white cliff on its western side. There is also a white patch on its summit, to the northward of the cliff. From this island the harbor bears N. by W. ½ W., distant about 28 miles.

There are but two hidden dangers in the harbor. The first is the

Southampton Rock, which lies in mid channel, bearing N. ½ W. from Vandalia Bluff, about three-fourths of the way between it and Centre Island. This rock is about 25 feet in diameter, and has 2 fathoms water upon it. It is marked by a white spar-buoy.

The second is the

Supply Rock, bearing S. by W., a short distance from Buisako Islet, and is a sharp rock, with 11 feet water upon it. Its position is designated by a red spar-buoy.

Both of these buoys are securely moored, and the authorities of Simoda have promised to replace them, should they by any cause be removed.

Centre Island, which receives its name from being the point from which the treaty limits are measured, is high, conical, and covered with trees. A cave passes entirely through it.

In the outer roads, or mouth of the harbor, a disagreeble swell is sometimes experienced; but inside of the Southampton Rock and Centre Island vessels are well sheltered, and the water comparatively smooth. Moor with an open hawse to the southward and westward.

There are good landings for boats in Simoda Creek, and at the village of Kakisaki.

A harbor master and three pilots have been appointed; wood, water, fish, fowls and eggs, also sweet potatoes and other vegetables may be procured from the authorities. It is necessary to supply them with casks to bring the water off.

Latitude of Centre Island	34° 39′ 49″ N.
Longitude " "	138° 57′ 50″ E.
Variation	52′ westerly.
H. Water, F. and C.	V. hr.
Extreme rise of tide	5 ft. 7 in.
Mean " "	3 ft.

To make the foregoing directions more easily comprehended, they have been rendered as concise as possible; but to furnish further information to navigators bound to, or passing the port, the following remarks are appended:—

* This is the most southwestern island of the chain of islands lying off the Gulf of Yedo.

The harbor of Simoda is near the southeastern extremity of the peninsula of Idzu, which terminates at the cape of that name. To the northward of the harbor, a high ridge intersects the peninsula, and south of this, all the way to the cape, it is broken by innumerable peaks of less elevation.

The harbor bears S. W. by W. from Cape Sagami, at the entrance of Yedo Bay, distant about 45 miles.

Rock Island is about 120 feet high, and a third of a mile in length, with precipitous shores and uneven outlines. It has a thick matting of grass, weeds, moss, &c., on the top.

From the summit of this island overfalls were seen, bearing N. ½ W., distant a mile or a mile and a half. These may have been caused by a rock or reef. An attempt was made to find it; but the strong current and fresh wind prevented a satisfactory examination. The Japanese fishermen, however, deny the existence of any such danger.

N. by W. from Rock Island, distant 2 miles, are the Ukona Rocks. These are two rocks, though they generally appear as one. The largest is about 70 feet high. Between these and Rock Island, the current was found setting E. N. easterly, fully four miles an hour.

Centre Island bears from Rock Island N. ½ E., distant 5 1-2 miles, and from Ukona Rocks N. by E. ½ E., distant 3 1-2 miles.

Buisako Islet lies N. N. E. from Centre Island. It is about 40 feet high, and covered with trees and shrubs.

Should the buoy on Southampton Rock be removed, the east end of Centre Island on with the west end of Buisako, will clear the rock to the westward.

Off the village of Susaki, and distant one-third of a mile from the shore, is a ledge of rocks, upon which the surf is always breaking; give them a berth of two cables in passing.

Approaching from the eastward, the harbor will not open until you get well inside of Cape Diamond.

To the northward of Cape Diamond is the bay of Sirahama, which is quite deep, and as it has also several sand beaches, it may be mistaken for Simoda; but as you approach this bay, Cape Diamond will shut in the Ukona rocks and Rock Island to the southward; whilst in the Simoda roads they are visible from all points.

Cape Idzu, latitude	34° 36′ 03″ N.
" longitude	138° 52′ 32″ E.
Rock Island, latitude	34° 34′ 20″ N.
" longitude	138° 57′ 10″ E.

S. W. ½ W. from Kozu Sima, distant about 20 miles, and south a little westerly from Cape Idzu, distant about 40 miles, there are two patches of dangerous rocks, 15 or 20 feet high, which have been named Redfield Rocks. They are in

Lat. 33° 56′ 13″ N.; long. 138° 48′ 31″ E.; and lat. 33° 57′ 31″ N.; long. 138° 49′ 13″ E.

These positions may not be strictly correct, but it is believed they are not much out of the way.

By order of Commodore M. C. Perry, U. S. N.

SILAS BENT,

Flag Lieutenant.

[*Japan Expedition Press.*]

U. S. STEAM FRIGATE MISSISSIPPI, AT SEA, *June* 27, 1854.

This is to certify, that Yohatsi, Hikoyemon and Dshirobe, have been appointed pilots for American vessels entering or departing from the port of Simoda, and that the following rates for pilotage have been established by proper authorities; viz:—

For vessels drawing over eighteen American feet	$15.00
For vessels drawing over thirteen and less than eighteen feet	10.00
For vessels drawing under thirteen feet	6.00

These rates shall be paid in gold or silver coin, or its equivalent in goods; and the same shall be paid for piloting vessels out, as well as into port.

When vessels anchor in the outer roads and do not enter the inner harbor, only half the above rates of compensation shall be paid to the pilots.

By order of the Commander-in-Chief.

Signed, SILAS BENT,

Flag Lieutenant.

Approved.

M. C. PERRY,

Commander-in-Chief of the U. S. Naval Forces in the East India, China, and Japan Seas.

U. S. STEAM FRIGATE MISSISSIPPI, SIMODA, ISLAND OF NIPHON, JAPAN, *June* 24, 1854.

[*Japan Expedition Press.*]

U. S. STEAM FRIGATE MISSISSIPPI, AT SEA, *June* 28, 1854.

REGULATIONS RESPECTING PILOTS, AND THE SUPPLYING OF AMERICAN VESSELS ENTERING THE PORT OF SIMODA.

A lookout place shall be established at some convenient point, from which vessels appearing in the offing can be seen and reported, and when one is discovered, making apparently for the harbor, a boat shall be sent to her with a pilot.

And in order to carry this regulation into full effect, boats of suitable size and quality shall always be kept in readiness by the harbor-master, which, if necessary, shall proceed beyond Rock Island, to ascertain whether the vessel in sight intends entering the harbor or not.

If it be the desire of the master of said vessel to enter port, the pilot shall conduct her to safe anchorage, and during her stay shall render every assistance in his power in facilitating the procurement of all the supplies she may require.

The rates of pilotage shall be: for vessels drawing over 18 American feet, fifteen dollars; for all vessels drawing over 13 feet, and less than 18 feet, ten dollars; and for all vessels under 13 feet, five dollars.

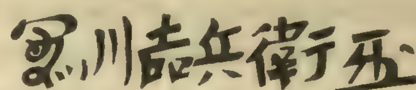
These rates shall be paid in gold or silver coin, or its equivalent in goods; and the same shall be paid for piloting a vessel out, as well as into port.

When vessels anchor in the outer harbor, and do not enter the inner port, only half the above rates of compensation shall be paid to the pilot.

The prices for supplying water to American vessels at Simoda, shall be fourteen hundred cash, per boat load (the casks to be furnished by the vessel).

And for wood delivered on board, about seven thousand two hundred cash, per cube of five American feet.

SILAS BENT,
Flag Lieutenant.



Signed, KURA-KAWA-KAHEI,
Lieutenant-Governor.

Approved.

M. C. PERRY,
Commander-in-Chief of the U. S. Naval Forces in the East India, China, and Japan Seas.
U. S. STEAM FRIGATE MISSISSIPPI, SIMODA, JAPAN, *June*, 23, 1854.

[*Japan Expedition Press.*]

U. S. STEAM FRIGATE POWHATAN, HARBOR OF HAKODADI, ISLAND OF YESSO, JAPAN, *May* 27, 1854.

SAILING DIRECTIONS FOR NAPHA, ISLAND GREAT LEW CHEW. BY SILAS BENT, LIEUT. U. S. N.

This is the principal seaport of the island, and perhaps the only one possessing the privileges of a port of entry.

Its inner, or "Junk Harbor," has a depth of water of from two to three fathoms, and, though small, is sufficiently large to accommodate with ease the fifteen or twenty moderate-sized junks which are usually found moored in it. These are mostly Japanese, with a few Chinese and some small coasting craft, which seem to carry on a sluggish trade with the neighboring islands.

The outer harbor is protected to the eastward and southward by the main land, whilst in other directions, it is surrounded by merely a chain of coral reefs, which answer as a tolerable breakwater against a swell from the northward or westward, but afford, of course, no shelter from the wind. The holding ground is so good, however, that a well found ship could ride out here almost any gale in safety.

The clearest approach to Napha from the westward, is by passing to the northward of the Amakarima Islands and sighting Agenhu Island, from whence steer a S. E. course for the harbor, passing on either side

of Reef Islands, being careful, however, not to approach them too near on the western and southern sides, as the reefs below water, in these directions, are said to be more extensive than is shown by the Charts.

After clearing Reef Islands, bring Wood Hill to bear S. S. E., when stand down for it, until getting upon the line of bearing for South Channel. This will carry you well clear of Blossom Reef, yet not so far off but that the White Tomb and clump of trees or bushes to the southward of Tumai Head (see View No. 3, on Chart) can be easily distinguished. An E. N. E. ¼ E., or E. N. E. course will now take you in clear of all dangers, and give you a good anchorage on or near the seven fathom bank, about half a mile to the northward and westward of False Capstan Head. This channel being perfectly straight, is more desirable for a stranger entering the harbor than Oar Channel, which, though wider, has the disadvantage of its being necessary for a vessel to alter her course some four or five points, just when she is in the midst of reefs which are nearly all below the surface of the water.

To enter by Oar Channel.—Bring the centre of the island in Junk Harbor (known by the deep verdure of its vegetation), to fill the gap between the forts at the entrance of Junk Harbor (see View No. 2, on Chart), and steer a S. E. ½ E. course, until Capstan Head bears east, when haul up to E. N. E., and anchor as before directed.

The North Channel.—Is very much contracted by a range of detached rocks making out from the reef on the west side, and should not under ordinary circumstances be attempted by a stranger; as at high water the reefs are almost entirely covered, and it is difficult to judge of your exact position, unless familiar with the various localities and landmarks. To enter by this (north) channel, bring a remarkable notch in the southern range of hills in line with a small hillock just to the eastward of False Capstan Head (see View No. 1, on Chart), and stand in on this range S. by E. ½ E., until Sumai Head bears E. ½ N., when open a little to the southward, so as to give the reef to the eastward a berth, and select your anchorage.

There is a black spar-buoy anchored on Blossom Reef, *half way between its eastern and western extremities*, a red spar-buoy on the point of reef to the W. N. W. of Abbey Point, and a white spar-buoy on the S. E. extremity of Oar Reef. Flags of corresponding colors are attached to all these buoys, and they afford good guides for the South and Oar Channels. There are two large stakes on the reefs to the eastward and westward of North Channel, planted there by the natives, this being the channel mostly used by the junks trading to the northward.

An abundance of fresh water can always be obtained at the fountains in Junk River, where there is excellent landing for boats. There is a good spring near the Tombs in Tumai Bluff, but unless the water is perfectly smooth, the landing is impracticable, and under any circumstances it is inconvenient from the want of sufficient depth, except at high tide.

It is directed by the commander-in-chief, that the vessels of the squadron under his command shall heave to on approaching Napha, and make signal for a pilot, when an officer familiar with the localities and landmarks will be sent off from the vessel in port to pilot her in, or point out to her commander the position of the dangers to be avoided.

Should there, however, be no vessel in port, then boats are to be sent ahead, and anchored upon the extremities of the reefs between which the vessel intends to pass.

By order of Commodore M. C. PERRY.

SILAS BENT,

Lieut. U. S. Navy.

MACAO, *October* 1, 1853.

NOTE.—The spar-buoys above described, were securely moored at the time they were placed in their respective positions, but may be displaced, or entirely removed by the heave of the sea, or by the natives, and should therefore not be entirely relied upon.

S. BENT.

Oonting, or Port Mellville, Island Great Lew Chew.—Oonting Harbor is on the N. W. side of Lew Chew, and distant about thirty-five miles from Napha.

Sugar-loaf Island, an excellant landmark, lies about twelve miles to the W. N. W. of the entrance. The island is low and flat, with the exception of a sharp conical peak near its eastern extremity, which rises to a height of several hundred feet.

Passing to the northward of Sugar-loaf Island, an E. southeasterly course will bring you to the mouth of the harbor, and to the northward and westward of Kooi Island. It is advisable to heave to here, or anchor in twenty or twenty-five fathoms water, until boats or buoys can be placed along the edges of the reefs bordering the channel; for, without some such guides, it is difficult for a vessel of large draft to find her way in between the reefs, which contract, in places, to within a cable's length of each other, and are at all times covered with water.

The ranges and courses for the channel are: first, Hele Rock in range with Double-topped Mountain (see View on Chart), bearing south 37° east. Steer this course, keeping the range on until Chimney Rock bears S. ¼ E.; then for Chimney Rock, till Point Conde bears S. 49° E.; then for Point Conde, until entering the basin of Oonting, when anchor; giving your ship room to swing clear of the reef making out to the northward of Point Conde, and you will be as snug as if lying in dock; with good holding ground, completely land-locked and sheltered almost entirely from every wind.

Good water is to be had at the village of Oonting.

By order of Commodore M. C. PERRY.

SILAS BENT,

Lieut. U. S. Navy.

SAILING DIRECTIONS AND OBSERVATIONS UPON LLOYD'S HARBOR, BONIN ISLANDS, FROM REPORTS OF ACTING MASTERS MADIGAN AND BENNETT, OF THE U. S. SHIPS SARATOGA AND SUSQUEHANNA.

"The entrance to the harbor of Port Lloyd, on the western side of Peel Island, one of the Bonin group, is well defined; so that it can scarcely be mistaken.

"A ship bound in, would do well to place a boat on the shoal that makes off south from the eastern point of Square Rock, as it is called on Beechy's Harbor Chart. This shoal can easily be seen from aloft, however, even when there is no swell on. It extends full two cables' length from Square Rock to the southward, and is steep. The centre of the shoal is awash with a smooth sea. The tide rises about three feet. There is a coral rock about one cable's length north from the northern point of Southern Head, on which I found *eight feet water*. But a ship entering the harbor would not be likely to approach Southern Head so near as to get upon it. This island, as well as those surrounding it, is chiefly visited by whale ships, and its products, therefore, are such as to suit their wants.

"Potatoes, yams, and other vegetables, fruits of various kinds, together with wild hogs and goats, can be procured from the few whites and Sandwich Islanders—thirty-five in all—settled there. Wood is good and plentiful, and water can be had, though in limited quantities, and slightly tainted by the coral rocks from which it springs.

"The anchorage is fair, though open to the south and west. The reconnoissance, made by order of the commander-in-chief, proved the accuracy of Capt. Beechy's chart."

Mr. Bennett, acting master of the Susquehanna, says in his report: "Assuming the position of Napha, in Great Loo Choo Island, as established by Beechy, to be correct, I find, by the mean of my chronometers, that he has placed Ten-fathom Hole, in Port Lloyd, five miles too far to the westward, and consequently the whole group is placed that much to the westward of its true position."

By order of Commodore M. C. PERRY.

SILAS BENT,

MACAO, *Oct.* 1, 1853. *Lieut. U. S. Navy.*

[*Japan Expedition Press.*]

U. S. STEAM FRIGATE MISSISSIPPI, AT SEA, *July* 20, 1854.

SAILING DIRECTIONS FOR HAKODADI. BY LIEUT. WM. L. MAURY, U. S. N.

This spacious and beautiful bay, which for accessibility and safety is one of the finest in the world, lies on the north side of the Straits of Sangar, which separate the Japanese Islands of Niphon and Yesso, and about midway between Cape Sirija Saki* (the N. E. point of Niphon) and the city of Matsmai. It bears from the cape N. W. ½ W., distant about 45 miles, and is about 4 miles wide at the entrance and five miles deep.

The harbor is the southeastern arm of the bay, and is completely sheltered, with regular soundings and excellent holding ground. It is formed by a bold-peaked promontory, standing well out from the high land of the main, with which it is connected by a low sandy isthmus, and, appearing in the distance as an island, may be readily recognized.

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* Saki in the Japanese language means Cape, consequently it should be more properly called Cape Sirija; but, to prevent mistakes, it has been thought advisable to adopt the Japanese names.

The town is situated on the N. E. slope of this promontory, facing the harbor, and contains about 6,000 inhabitants.

Approaching from the eastward, after passing Cape Survo Kubo, named on our chart Cape Blunt, which is a conspicuous headland 12 miles E. by S., from the town, the junks at anchor in the harbor will be visible over the low isthmus.

For entering the Harbor.—Rounding the promontory of Hakodadi, and giving it a berth of a mile, to avoid the calms under the high land, steer for the sharp peak of Komaga-daki, bearing about north until the east peak of the Saddle, bearing about N. E. by N., opens to the westward of the round knob on the side of the mountain, then haul up to the northward and eastward, keeping them open until the centre of the Sand Hills on the isthmus bears S. E. by E. ¾ E. (these may be recognized by the dark knolls upon them). This will clear a spit which makes out from the northwestern point of the town in a N. northwesterly direction two-thirds of a mile; then bring the Sand Hills a point on the port bow, and stand in till the northwestern point of the town bears S. W. ½ W., when you will have the best berth, with five and a half or six fathoms water.

If it is desirable to get nearer in, haul up a little to the eastward of south, for the low rocky peak which will be just visible over the sloping ridge to the southward and eastward of the town. A vessel of moderate draught may approach within a quarter of a mile of Tsuki point, where there is a building yard for junks. This portion of the harbor, however, is generally crowded with vessels of this description; and unless the want of repairs, or some other cause, renders a close berth necessary, it is better to remain outside.

If the Peak or Saddle is obscured by clouds or fog, after doubling the promontory steer N. by E. ½ E. until the Sand Hills are brought upon the bearing above given, when proceed as there directed.

A short distance from the tail of the spit, is a detached sandbank with 3½ fathoms on it, the outer edge of which is marked by a white spar-buoy. Between this and the spit there is a narrow channel with 4½ fathoms water. Vessels may pass on either side of the buoy, but it is most prudent to go to the northward of it.

Should the wind fail before reaching the harbor, there is a good anchorage in the outer roads in from 25 to 10 fathoms.

Excellent wood and water may be procured from the authorities of the town, or, if preferred, water can easily be obtained from Kamida Creek, which enters the harbor to the northward and eastward of the town.

The season, at the time of our visit, was unfavorable for procuring supplies; a few sweet and Irish potatoes, eggs and fowls, however, were obtained; and these articles, at a more favorable period of the year, will no doubt be furnished in sufficient quantities to supply any vessel that may in future visit the port.

Our seine supplied us with fine salmon and a quantity of other fish, and the shores of the bay abound with excellent shell-fish.

During our stay in this harbor, from May 17 to June 3, the weather was generally pleasant, until

June 1, when the fog set in. It was usually calm in the morning, but towards the middle of the day a brisk breeze from S. W. sprung up.

Latitude, mouth of Kamida Creek	41° 49′ 22″ N.
Longitude " " "	140° 47′ 45″ E.
Variation	4° 30′ 0″ W.
High water, full and change	V. hours.
Extreme rise and fall of tide	3 feet.

Our chronometers were rated at Napa Kiang, Lew Chew, from the position of that place as given by Captain Beechy, R. N.

By order of Commodore M. C. PERRY, U. S. N.

SILAS BENT,

Flag Lieutenant.

[*Japan Expedition Press.*]

U. S. STEAM FRIGATE MISSISSIPPI, AT SEA, *July* 21, 1854.

ADDITIONAL REGULATIONS.

Agreed to between Commodore Matthew C. Perry, Special Envoy to Japan, from the United States of America, and Hayashi Daigaku no-kami; Ido, Prince of Tsus-sima; Izawa, Prince of Mima-saki; Tsudzuki, Prince of Suruga; Udono, Member of the Board of Revenue; Take no uchi Sheitaro, and Matsusaki, Michitaro; Commissioners of the Emperor of Japan, on behalf of their respective Governments.

Article I.—The Imperial Governors of Simoda will place watch stations wherever they deem best to designate the limits of their jurisdiction; but Americans are at liberty to go through them unrestricted, within the limits of seven Japanese Ri, or miles; and those who are found transgressing Japanese laws, may be apprehended by the police, and taken on board their ships.

Article II.—Three landing places shall be constructed for the boats of merchant ships and whale ships resorting to this port; one at Simoda, one at Kakizaki, and the third, at the brook lying S. E. of Centre Island. The citizens of the United States will, of course, treat the Japanese officers with proper respect.

Article III.—Americans, when on shore, are not allowed access to military establishments, or private houses, without leave; but they can enter shops and visit temples as they please.

Article IV.—Two temples, the Rioshen at Simoda, and Yokushen at Kakizaki, are assigned as resting places for persons in their walks, until public houses and inns are erected for their convenience.

Article V.—Near the Temple Yokushen, at Kakizaki, a burial-ground has been set apart for Americans, where their graves and tombs shall not be molested.

Article VI.—It is stipulated in the treaty of Kanagawa, that coal will be furnished at Hakodadi; but, as it is very difficult for the Japanese to supply it at that port, Commodore Perry promises to mention this to his government, in order that the Japanese government may be relieved from the obligation of making that port a coal depot.

Article VII.—It is agreed, that henceforth the Chinese language shall not be employed in official communications between the two governments, except when there is no Dutch interpreter.

Article VIII.—A harbor master and three skilful pilots have been appointed for the port of Simoda.

Article IX.—Whenever goods are selected in the shops, they shall be marked with the name of the purchaser and the price agreed upon, and then be sent to the Goyoshi, or government office, where the money is to be paid to Japanese officers, and the articles delivered by them.

Article X.—The shooting of birds and animals is generally forbidden in Japan, and this law is, therefore, to be observed by all Americans.

Article XI.—It is hereby agreed that five Japanese Ri, or miles, be the limit allowed to Americans at Hakodadi; and the requirements contained in Article I. of these regulations are hereby made also applicable to that port, within that distance.

Article XII.—His Majesty, the Emperor of Japan, is at liberty to appoint whoever he pleases, to receive the ratification of the treaty of Kanagawa, and give an acknowledgment on his part.

It is agreed that nothing herein contained shall, in any way, affect or modify the stipulations of the treaty of Kanagawa, should that be found to be contrary to these regulations. In witness whereof, copies of these additional regulations have been signed and sealed in the English and Japanese languages by the respective parties, and a certified translation in the Dutch language, and exchanged by the Commissioners of the United States and Japan.

(Signed) M. C. PERRY,

Commander-in-chief of the U. S. Naval Forces in the East India, Chinese, and Japan Seas; and Special Envoy to Japan.

SIMODA, JAPAN, *June* 17, 1854.

From Captain George A. Potter, of Ship Architect.

February 17, 1854.

Vessels departing from Hong-Kong, bound to Shanghai, in the northeast monsoon, should be in good condition to contend with rough weather, and to carry sail. Upon leaving, the Lyemoon or Lammat Channel can be taken, the latter being preferable in a large vessel. When clear of the islands, the wind will be found to be about E. N. E. generally, or as the line of coast trends, and when the monsoon is not heavy, periodical changes of wind occur. At such times, vessels should be close in with the land early in the morning, and tack off shore at about 8 o'clock, standing off till about 2 P. M., and on the in-shore tack standing boldly in to the coast, making such arrangements during the night as will bring the vessel in a position in shore again in the morning. When the monsoon is moderate, vessels should not stand far into the bays, as they will, by so doing, experience light winds, and oftentimes calms; and, on the contrary, when the monsoon is strong, they should stand as far as possible into the bays, and not stand further off than is actually necessary, especially as the changes of wind above alluded to seldom occur at such times. It would be well to add here, that vessels almost always go faster in shore than they do off, as there is a ground swell heaving after them when in with the land.

During the severe monsoon gales, which last about three days, vessels should seek shelter in one of the numerous good anchorages to the westward of Breaker Point, when, upon the breaking up of the gale, they can make a fresh start, and perhaps get round Formosa before encountering another, especially after the month of November. Having reached Breaker Point, vessels should then stretch over for the south end of Formosa, and upon getting to the eastward, the wind will be found to veer northerly, or more, as the coast of Formosa trends; and a good sailing vessel will be almost sure to fetch the South Cape or Lamay Island to windward. Upon getting in with the land, light variable winds and calms are often met with, but the strong current to the S. W. will very soon drift the vessel down, when she will find the breeze coming on fresh again. In passing the South Cape in the daytime, vessels should keep close in to the land, and the nearer the shore the stronger the favorable current, there being no hidden dangers. In passing round in the night, however, and when there is no moon, it will be advisable to pass to the southward of the Vela Rete Rocks, and tacking to the N. W. when nearly in the longitude of Gadd's Reef, or sooner if it is daylight, as the South Cape of Formosa is very low, and rather unsafe to approach in a dark night; and again, when a gale comes on, and a vessel, being to the westward of the cape and near it, is obliged to heave to, a strict lookout should be kept during the night, as several vessels, under these circumstances, have found themselves to the eastward of the cape in the morning, having been drifted to windward during the night, and passed, probably, within a dangerous proximity of the Vela Rete Rocks. The current sets sometimes with incredible velocity round the cape, and then up northward along the coast, and the stronger the northerly gale, the stronger the weather current, gradually diminishing in strength towards the north end of Formosa. After rounding the cape, vessels should work short tacks along the east coast of Formosa, keeping close in shore to get the benefit of the current. Having reached the northeast cape of Formosa, and the wind does not veer to the eastward, which is sometimes the case, vessels should keep between the meridians of the Barren Islands and the islands off the north end of Formosa, and not stretch in for the coast of China until able to make a lead in for Video or Leuconna. Thence to Shanghai, they may follow the Sailing Directions given by Captain Collinson, R. N., which will be found in Horsburgh, or the directions given in a pamphlet entitled *Practical Instructions for Navigating the Yantze Kiang*, by Walter Macfarlane, Esq., which are more explicit, and written by a gentleman of long experience in those localities.

Regarding the passage to or from Shanghai in a fair monsoon, little can be said excepting that coasting vessels, when without observations, are in the habit of sighting the land to verify their reckoning. In the northeast monsoon there is a constant current down the coast, running with more or less velocity according to the strength of the wind; and the wind generally blows along the line of coast, that is, E. N. E. from Hong-Kong to Breaker Point, N. E. in the Formosa Channel, and N. N. E. from Formosa north. The first part of the monsoon is very strong, and frequently in the month of October it is almost an incessant gale; in the latter stage, from January to May, S. E. winds are not uncommon, and the more frequent as the season advances; there is considerable thick weather in the latter part of the monsoon, and a S. E. wind to the northward of Formosa almost invariably brings a dense fog with it. The passage from Shanghai to Hong-Kong in the S. W. monsoon is very tedious, from the frequent calms and squalls, and constant strong current up; and coasting vessels generally use their kedge when there is not sufficient wind to make any

progress. In working down, it is well to keep in with the coast, stretching into bays and by headlands to get out of the current, if there is sufficient wind to preclude the probability of getting becalmed.

From the month of July to the latter part of September, and sometimes October, is considered the typhoon season; and at this season of the year a barometer cannot be watched too closely. Typhoons have happened in May and June, but very seldom. These storms appear to originate to the eastward, in the Pacific Ocean; and, passing the Bashee Islands, travelling to the southward of west, their centres pass nearly over the parallels of Hong-Kong and Macao. A falling barometer, with a northerly wind, is almost a sure symptom of the approach of a cyclone in this vicinity. These storms, coming from the eastward, are sometimes probably turned off from their usual course by the high land of Formosa intervening between them and the China coast, and at such times they travel up north, curving again to the westward. This inference somewhat accounts for the fact that Amoy is seldom visited by these storms, and they are never felt there with such a degree of severity as at the other ports to the northward and southward of Formosa. These storms are also generally preceded by a heavy swell from N. E. to E.

ROUTES FROM EUROPE AND THE UNITED STATES TO AUSTRALIA.

The gold ports of Australia, whether the distance be measured *via* Cape Horn, or by the way of the Cape of Good Hope, are between 12,000 and 13,000 miles from the Atlantic ports of the United States or Europe. The best way for vessels in the Australian trade, from Europe or the Atlantic ports of America, to *go*, is by doubling the Cape of Good Hope; and the best way to *come*, is *via* Cape Horn; and for this reason, viz: The prevailing winds in the extra-tropical regions of the southern hemisphere are from the N. W., which of course makes fair winds for the outward bound around the Cape of Good Hope, and fair winds for the homeward bound around Cape Horn. Here, all is plain sailing; vessels homeward bound should steer by the shortest cut for Cape Horn, and the outward bound, after clearing the calms of Capricorn in the Atlantic, should shape their course as direct for the port of destination as the land and ice and the winds will permit them.

Returning by the way of Cape Horn homeward, the best route is to get south of the parallel of 45° or 50° S., as soon as you can by a S. E. course. Do not hesitate, if the winds favor, to pass south of New Zealand. But whether you pass south of these islands or not, as soon as you get clear of them, let the course be shaped direct for Cape Horn; recollecting that the further you keep south of the *middle* of the *straight* line on your *chart* from Van Dieman's Land to Cape Horn, the nearer you are to the great circle route, and the shorter the distance. The difference by the great circle, and by the straight course on the Charts, being upwards of 1,000 miles.

In the passage from Australia to Cape Horn, by keeping between the parallels of 45° and 60° all the way, you will, I am of the opinion, feel more or less the warmth and set of a current that passes south of Australia from the Indian Ocean. Whether the boisterous weather, to which a warm current in such latitudes would give rise, will compensate for the advantages to be gained in other respects, must be left

for experience to determine. For my own part, I do not suppose this current to be as strongly marked as is our Gulf Stream in the Atlantic. It is represented on Plate XIX. The passage from the Capes of the Delaware to Liverpool may be considered as affording us the means of judging pretty accurately as to this passage from Australia; the chief difference being in the climate and the gales, and the rolling sea and a greater prevalence of westwardly winds.

The climate in the Pacific along this route will be found not quite so mild as is that along the European route in the Atlantic. But the gales in the Atlantic are probably more frequent and violent than they are in the South Pacific; at any rate, I suppose that such will be found to be the case, until you reach the regions of Cape Horn.

The Australian routes present frequent opportunities for fine runs. In the South Indian and Pacific Ocean, below the parallel of 40° S.—particularly between 45° and 50° lat.—and away from the influence of the land—as along this route, especially from New Zealand to Cape Horn—the westerly winds blow almost with the regularity of the trades; and a fast vessel, taking a westerly gale as she clears the New Zealand Islands, may now and then run along with it pretty nearly to Cape Horn; or taking it on the outward passage after clearing the southeast trades of the Atlantic, may, by keeping well south, run along with it to Van Dieman's Land.

The United States and Australia are nearly antipodal. A diameter of the earth having one end in the Atlantic upon the parallel of 38° N. at its intersection with the meridian of 35° W. would have the other near Port Philip, New South Wales. It will therefore be perceived how that the meridians of many places in America being followed to the south pole, and thence onward, would guide one to various places in New Holland. Thus, the same meridian line which passes through Eastport, in Maine, being continued on the other side of the world, will be found to pass near the Swan River settlement of the great Gold Continent. This meridian is a great circle; and the intercepted arc of it, therefore, represents the shortest distance between any two places that are situated upon it.

Hence, it will be perceived that the great circle from New York to Australia passes very nearly through the axis of South America, thence south through the antarctic regions, and so on northwardly again, till it reaches this modern Ophir. But this route is impracticable to the navigator, and it is therefore useless to give him sailing directions for it.

Let us, however, look for one, which, being practicable, will be found to deviate as little as possible from the great circle, and which, moreover, all things being considered, offers to vessels in the Australian trade from Europe, as well as from the United States, the fairest prospect of the most speedy passages. Having found such a route, I propose to give those navigators, whether American or European, who are co-operating with me in collecting data for my researches, the benefit of additional sailing directions for Australia, or at least such farther suggestions with regard to the passage, as I at present feel prepared to make.

As the great circle from New York to Port Philip passes through South America, and as the land blocks the way so that ships cannot go west of that meridian, we must look to the eastward of it for the

most practicable route. We *must* pass east of Cape St. Roque; it and Port Philip may be considered for all our present purposes to be actually, as in reality they nearly are, on the same meridian. To find the great circle distance between two such places, we have but to add the co-latitude of one to the co-latitude of the other, and their sum gives what is sought. Thus, the co-latitude of the St. Roque is 84° 32′, and of Port Philip 51° 41′, the sum of which is 136° 13′ of co-latitude.

It will suit the purposes of illustration better, to count from the equator in the Atlantic at its intersection with the meridian of St. Roque (35° 24′), from which point the great circle distance to Australia is 8,500 miles.

Now, all ships, whether from North America or Europe, that are bound into the southern hemisphere, are advised to cross the line to the eastward of this meridian. Therefore, the great circle from St. Roque is not yet far enough to the eastward for the navigator. Suppose, then, the average crossing-place of the line in the Atlantic to be, as it really is, in 30° west; let us project the great circle from this point. From this crossing to Port Philip, the most remote parallel touched by the great circle, is about 84° S. near its intersection with the meridian of 60° E., and the distance to Australia is 8,480 miles.

It will be as well for the navigator who is aiming for a quick passage—and who in these times is not?—to notice how this great circle from the line in 30° W. runs. It crosses the parallel of 10° S. near 28° 50′ W.; of 20°, near 27° 30′ W.; of 30°, near 26° 00′ W.; of 40°, near 24° 20′ W.; and of 50°, near 21° 50′ W., &c.

This route is also impracticable, for it takes one too far south. But it will serve as a guide to another, which Mr. Towson, of Liverpool, has designated the "composite," which will enable the navigator to take the nearest route that is practicable.

Vessels that are bound southeastwardly, after crossing the line in 30° W., can generally reach, without being pinched by the way, 30° S. between 30° and 20° W. The great circle distance thence to Port Philip is, *if it could be followed*, about 6,700 miles; but it crosses the barriers of perpetual ice which forbid the passage through the antarctic regions. But, if a vessel do not go south of 55°, she cannot accomplish the distance to Port Philip, from the parallel and meridian of 30°, in less than 7,300 miles. It will be observed that, since a vessel cannot make easting in the S. E. trades, vessels crossing the line in 30°, or indeed on any other meridian, will find themselves generally forced a little to the westward of the great circle to Port Philip from the point of equatorial crossing, be that upon what meridian it may.

The majority of vessels bound around the Cape of Good Hope, cross the meridian of 20° W. between the parallels of 30° and 35° S. Here, they generally aim to make a course a little to the south of east. But the great circle route to Australia would, were it practicable, require them to pass the parallel of 70° S. before crossing this meridian of 20° W. That route is the nearest which, being practicable, deviates the least from the great circle. Therefore the course of the Australian-bound vessel when she clears the calm belt of Capricorn, between the meridians of 20° and 30° W., which we will suppose she generally does by the time she reaches the parallel of 30° S., is tangential to the parallel of the highest degree of latitude that she intends to reach. The distance and "composite" routes are subjoined for the parallels as "vertices" of 45°, 50° and 55°, S. from 30° S., and from the meridians of 30° and of 20° W. respectively:

From 30° S. and 30° W. to 45° S. in 20° E., thence E. to 120° E., and thence by tangent to Port Philip 8,000 miles.

Ditto by tangent to 50° S. in 30° E., then to 100° E., and thence to Port Philip, 7,700.

From 30° S. and 20° W., by tangent to 45° S. in 30° E., and thence, as upon the parallel of 45° from 30° W. to Port Philip, 7,600.

From ditto, to 50° S., long. 40° E., and thence to Port Philip as before from 30° W., 7,300.

From 30° S., long. 25° W. by tangent to the parallel of 55° in long. 40° E., and thence along this parallel to 90° E., and thence by tangent to Port Philip, the distance is 7,300 miles.

These tangential curves are arcs of great circles; and the navigator who will not take the trouble to get out these curves so that he may follow them to and from the parallel or "vertex" upon which he proposes to "run down his longitude," but prefers the rhumb-line course, must make up his mind to the loss to be incurred, for even in the cases quoted above, he will lose by the rhumb-line course from a few hours' to a day's sail, according to circumstances.*

At any rate, when he comes to view the route to Australia as here described, he will perceive that the route to the Cape of Good Hope turns off from it about the parallel of 30° S., and that therefore Australian bound vessels do not care to make so much easting in the trades as do those vessels that desire either to touch at or double close around the cape; consequently, it is no object with them to hug the trades as close as the cape-bound vessels do.

Here, then, as you clear the belt of S. E. trade-winds, there is a fork in the road. The vessel bound to the cape going to the east; but she whose destination is for the gold fields south, should stand on to the southward, not thinking of hauling up to the eastward until she clears the calms of Capricorn, and finds herself well within the region of the trade-like westerly winds of the southern hemisphere.

She may then begin to edge away and to haul up gradually to the eastward, crossing 10° W. between the parallels of 40° and 50° according to the season, and reaching her extreme southern parallel in our winter months near the meridian of 20° E. Upon this parallel (unless experience shall prove that she may, without inconvenience as to ice and weather, go farther south 55°, and the farther south the shorter the distance), she should run along her vertex till she crosses the meridian of 90° or 100° east, when she

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* In 1847, Mr. J. T. Towson, of Liverpool, computed a set of tables to "facilitate the practice of great circle sailing," which are published by the Admiralty. By these tables Mr. Towson has won the credit of having systemized and introduced regularly into the art or science of practical navigation, a new branch which is now known as "composite sailing." That is, when a navigator makes up his mind to "run down his longitude" upon a certain parallel, the nearest way for *him* to get on that parallel is by arc of great circle which passing through the place of his ship is tangent to that parallel. Likewise, in quitting that parallel, called the "vertex," the nearest way is again by arc of tangential great circle which passes through his place of destination. Mr. Towson's tables afford the navigator simple rules and methods for finding his courses and distance by such arcs.

More recently, Professor Chauvenet, of the Naval Academy at Annapolis, has invented a "Great Circle Protractor," by which the navigator can lay off exactly and with great facility the arc of a great circle, however short, which he wishes to follow. In finding the arc, the protractor shows also the courses and distance. The contrivance is exceedingly simple and beautiful, making "composite sailing" very easy. The navigator, therefore, who wishes to "cut off all the corners" and save every mile possible, should, instead of taking the rhumb-line courses above suggested, to and from his "vertex," supply himself with one of these works, that he may get off and on his vertex by great-circle arcs.

may begin gradually to edge up for her port, but still keeping to the right of the rhumb-line on her chart, that leads to it. Hence, it will be perceived that Australian-bound vessels have nothing to do with the Cape of Good Hope; they do not wish to go within scarcely a thousand miles of it.

The best crossing-place of 25° or 30° south, that the S. E. trades will generally allow for the Australian route, is about 30° W., a few degrees more or less. Here, the winds being fair, the great circle from this crossing to Port Philip will give the navigator a very correct idea as to the best course for him to pursue after reaching 25° or 30° S., at the crossing above mentioned.

The distance from it to Port Philip is about 6,500 miles, the arc of the great circle crossing the prime meridian between the parallels of 70° and 75° S., the meridian of 55° east between the parallels of 80° and 82° S. Here it reaches its greatest southern declination, and begins then to incline northwardly.

Australian-bound vessels, therefore, are advised, after crossing the equator near the meridian of 30° W., say between 25° and 32°, as the case may be, to run down through the S. E. trades, with topmast-studding-sails set, if they have sea room, aiming to cross 25° or 30° south, as the winds will allow, which will be generally somewhere about 28° or 30° W., and so on, shaping their course, after they get the winds steadily from the westward, more and more to the eastward, until they cross the meridian of 20° E., in about lat. 45°, reaching 55° south, *if at all*, in about 40° east. Of the "fleet of a thousand sail," that is co-operating with me, the Nightingale, that has made the quickest run yet from the parallel of St. Roque, went to 57° S. Thence the best course—if ice, &c., will allow—is onward still to the southward of east, not caring to get to the northward again of your greatest southern latitude, before reaching 90° east. The highest latitude should be reached between the meridians of 50° and 80° east. The course then is north of east, gradually hauling up more and more to the north as you approach Van Dieman's Land.

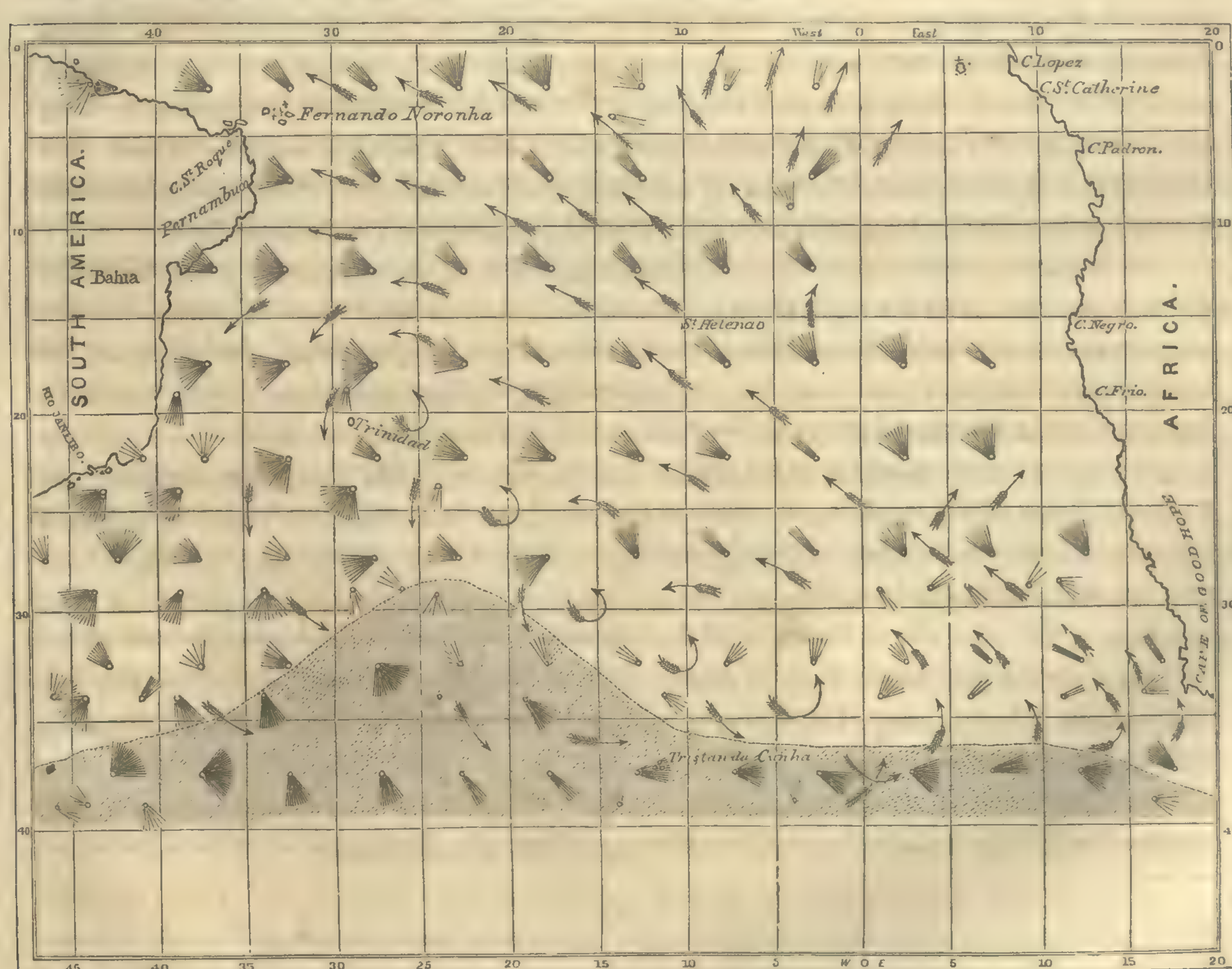
Such is the best route to Australia—the highest degree of south latitude (and, as a rule, the farther you go south, the shorter the distance) which it may be prudent to touch, depending mainly on the season of the year and the winds, the state of the ship, and the well-being of the passengers and crew. If the winds are not good and strong, bear south to look for them. In our summer, one will not have to go so far south to look for these winds as he will in our winter. The shortest passages, therefore, will probably be made in the southern spring and early summer, when daylight, the winds, the state of the weather and all except ice, are most favorable for reaching high southern latitudes. The Pilot Charts in process of construction for the South Pacific, seem to indicate that there is a belt of westerly winds between 45° and 50° S., which are most constant and steady. If this should prove to be so, the discovery will be of great importance.

I have had occasions several times to acknowledge obligations to Lieut. Marin Jansen, of the Dutch Navy, for valuable suggestions. It is rare to find a better thinker, or a more efficient co-laborer, than he is. Yesterday I received a letter from him, dated at Delft, March 2, 1855, in which he calls my attention to a remarkable peculiarity of the winds in the South Atlantic, and which bears directly upon the passage to the Cape, India, and Australia, from the United States as well as from Europe.

"Now," says he, "a few words about the S. E. trade-wind in the South Atlantic. I have remarked that, in February, nearly all the ships coming round the Cape of Good Hope find S. E. winds in the Atlantic;

they lose them only when they turn too sharp round the cape and cross 30° S. east of 10° E., and 25° S. east of 5° E., probably through the influence of the land, by which the S. E. is turned to S. W. and W., according to the position of the ship in regard to the land.

"We can say in general, ships coming round the Cape of Good Hope find the S. E. trade-wind in the South Atlantic in February, after rounding the cape, in 34° S. But ships going from the equator to the cape generally lose the S. E. trade-wind in February, on the meridian of 30° W., near 23° S.; on the meridian of 25° W., near 27° S.; on the meridian of 20° W., near 30° S.; on the meridian of 15° W., near 33° S. And when I say lose the S. E. trade, I mean that the wind comes north of east. The S. E. trade blows easterly in 10° S. when west of 28° W. Farther eastward we find the S. E. trade more southerly. From the equator in the track of the outward bound ships in February, the wind at first S. E. by S. (true) becomes soon S. E. and E. S. E., when west of 28° W., and slower to the eastward. When the wind is east it goes generally north of east when ships stand to the south, and then from north to northwest. But when ships, with the wind from north, go too far east, then the wind turns from N. W. quickly to S. W. and S. E., and they are obliged to tack and run out of the S. E.; wherefore its limits invariably commence to be E. S. E. and E., and N. E. and N. to N. W. (See the arrows on the diagram.)



"Of course, ships must try to avoid running again in the S. E. trade after losing it. Ships bound to the East Indies have thus no advantage in crossing the equator so far to the east; they are compelled, by the wind, to run out of the S. E.; and because the S. E. is more easterly west of 25° W., and more southerly east of it. I think this is the best illustration why they should cross the equator west of 25° W. with great advantage, and why ships bound to Australia do better to avoid the proximity of the limit of the S. E. trade-wind, and steer clear of those turning winds generally accompanied with calms.

"In another letter I'll give you the S. E. in August, with the demonstration that the S. W. monsoon is not the N. E. trade, as was supposed, but a continuation of the S. E. trade."

Another fact in illustration of not crossing the line, on the route from Europe, to the east of 25° W., is afforded by the following statement:—

"Jan. 23d, '54. Lat. 30° 05′; long. 41° 37′.

"Moderate and fine throughout. 1 P. M., spoke British ship Lord Dufferin, 68 days from Cardiff, for San Francisco. Reports crossing the line in long. 24°, and being becalmed there twenty-one days, in company with many vessels. His long. is 40° 20′, which cannot be correct,* being thirty miles to the west of ours, and if right we should have passed close to shore, in clearing St. Augustine, although he says he compared with several on the line. Many birds about."—(*Abstract Log, ship John Haven, Ricker, from New York to San Francisco.*)

The arrows of the diagram are Jansen's; the wind-vanes or brushes have been added, at my request, by Professor Flye. The data for them are afforded by the Pilot Charts of the South Atlantic. These brushes are only for February, and they merely indicate the direction of the *prevalent* winds, the heaviest shading denoting the *most* prevalent quarter. February is the southern summer; and how beautifully does this little diagram unmask the effects of the Pampas of Buenos Ayres on one hand, and the Deserts of Africa on the other, upon the winds at sea! The calm belt of Capricorn, here, at this season, instead of being between parallels, stretches off in the direction from Rio towards the Cape of Good Hope; so that, in this month especially, vessels bound towards the Cape of Good Hope, so far from gaining, actually lose —as suggested by Jansen, and proved by Capt. Ricker—by crossing the line east of 25° W.

We have here also revealed to us the cause of the difficulty which homeward bound vessels from Rio frequently find in getting an offing. It is because this calm belt is there, and it is placed there by the conflict in the air between the plains of South America and South Africa; one drawing the trade-wind east, the other west from its regular course.

Then on the polar side of the region of the S. E. trades there seems to be a sort of neutral ground, which is shaded on the diagram, in which neither Africa nor America has anything to do with the winds. There appears to be here a sort of reflection, or mould in the air, of the tongue of cold water (Plate XIX.), from the antarctic regions.

Now, besides this new and very singular feature in the summer (*our* winter) winds of the South Atlantic, the first thing that will probably strike the navigator who has not been accustomed to measure

* On making the land, we proved to be correct, and his long. 30 miles wrong.

on a terrestrial globe the distance between places, will be the fact that the Cape of Good Hope, instead of being a sort of half-way station on the road-side between Europe or the United States and New Holland, is some thousand miles or more to the northward of the shortest and best route.

And the next thing will be, that the best crossing on the equator for Australian-bound vessels from the United States is not to the eastward, but it is on the same meridian which affords the best crossing for the Rio or Cape Horn bound vessels.

Vessels, therefore, bound to Australia from the United States, or Europe, should take the Rio route as far as the equator. Indeed, the route around Cape Horn to Australia, to the Cape of Good Hope and to India, may be considered as one and the same until the belt of S. E. trades in the Atlantic be passed. Vessels bound from Europe, should aim to cross the equator between 25° and 30° W. Farther east would take them where the equatorial doldrums will prove troublesome, and when the S. E. trades will be more difficult to him; farther west, too far out of the way.

Having crossed the equator, with sea room and a good offing from the shores of Brazil, the best course for all, whether European or American, is, as before stated, to crack on through the S. E. trades with topmast studding-sails set, or at any rate with a clean rap-full. When these winds fail, as they will do, from 25° S. in *our* summer and fall, to 35° or even 40° in *our* winter and spring—especially on the African side—and the Australian trader finds himself in the horse latitudes of the southern hemisphere, his course is then nearly due *south* until he gets beyond them, and well into the strong westerly winds of that region. These winds will be found on the American side, or W. of 20° W., between 35° and 40° S.; but in east longitude they will be found between the parallels of 45° and 55°, according to the season of the year, to prevail with great regularity and force; moreover, they are accompanied by that long rolling swell which will of itself help a vessel along many miles a day.

All the abstracts which I have as yet received from Australian-bound traders, go to confirm and illustrate, in the most beautiful manner, everything that I have previously said with regard to the westerly trades of the extra tropical south, and the advantages of the southern route to Australia. I have endeavored to impress navigators with a sense of the mistake they commit in considering the Cape of Good Hope on the way-side of their best route to Australia. It is not only a long way out of the best and most direct track for them, but the winds also, to the north of the fortieth parallel of south latitude, are much less favorable for Australia than they are to the south of this parallel. *Sailing Directions** issued by the British Admiralty, I am aware, recommend the Cape of Good Hope route, and the parallel of 39° south, as the best upon which to run down easting for Australia.

I quote from these *Sailing Directions*:—

"Ships from the Cape of Good Hope, bound to the south coast of Australia, should run down their longitude on the parallel of 39° south, where the wind blows almost constantly from some western point, and generally not with so much strength as to prevent sail being carried to it. In a higher latitude, the weather is frequently more boisterous and stormy, and sudden changes of wind, with squally, wet weather,

* 1853.

are almost constantly to be expected; especially in the winter season, and after passing the island of St. Paul and Amsterdam. Islands of ice have also been encountered in those regions, as was almost fatally proved by H. M. ship Guardian striking against one in 46° or 47° south, in the beginning of summer, and nearly foundering."* In a note to this paragraph of the *Australia Directory*, it is added: "In summer, however, a route on the principle of great circle sailing, termed 'composite route,' may be advantageously adopted. See *Tables to Facilitate the Practice of Great Circle Sailing.* By J. T. Towson. Fourth edition, page 49; published at the Hydrographic Office, Admiralty."

It is in the fall and winter months, when the sea is most free from icebergs—not in the summer, for every one knows that icebergs are often seen in the North Atlantic in June, and not unfrequently in July. December and January are probably the worst months for ice along the Australian route. By March, all that the summer heat could set adrift have been borne north and melted; the southern winter is the time when the icebergs are held fast, for then they are forming for the heat of the next spring and summer to break out and set adrift.

The maximum latitude, or the "vertex," to be used, must, as before said, depend upon the season of the year; and what that "vertex" is to be for any season, is one of the objects of present inquiry, and of these investigations touching the Australian route; it will depend upon winds, weather, ice, &c.

I hope the abstract logs from vessels in that trade will, ere long, enable me to make a satisfactory and proper decision upon this point. For, by ascertaining that point, I expect to be able to fix definitely upon a route which shall bring Australia *permanently* on the average some thirty days or more nearer to the United States and Europe, than by the admiralty route, along the parallel of 39°, it is, ever has been, or can be.

In recommending this new route, and a route which differs so widely from the favorite route of the admiralty, I should remark that I do it, not because it is an approach to the great circle route, nor because it has anything to do with the composite track, but because the winds, and the sea, and the distance, are all such as to make this route the quickest. I say the sea, because I suppose there is no more danger from icebergs if a proper lookout be kept, than there is on the voyage between New York and Liverpool. Three ships have reported, in their abstract logs, ice on the Australian voyage, viz: The Malay, Capt. Hutcherson, 21st of December, 1853, lat. 48° 25′ S., long. 35° 24′ E.; the Oriental, Capt. Heard, 11th of December, 1853, lat. 46° 25′, long. 125° E.; and the Auckland, Capt. Nelson, 25th of October, 1853, lat. 53° 12′, long. 21° 23′ E. Horsburgh, in his *Directory*, mentions, at pages 89–90, ice as having been seen 24th of December, 1789, by H. B. M. S. Guardian, lat. 44° ¼ S., long. 44° ½ E.; by the French ship Harmonie in April, 1828, lat. 35° 50′, long. 18° E. It is, however, very rare for ice to be seen in such a place!

Under these circumstances, and until navigators will furnish a sufficient number of journals, we cannot advise navigators exactly how far south to go without incurring risks from icebergs. They certainly may venture farther to the southward in some months than in others; but how far in each month, and with what profit, remains for future investigations, based on more ample materials than have yet come to my

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* The Australia Directory, vol. i. Edited by John Burdwood, Master, R. N. Fourth edition, printed for the Hydrographic Office, Admiralty, Dec. 1, 1853; Chapter I. page 1.

hands, to determine. These reports about icebergs seem to place them near the meridian of the Cape on one side, and the longitude of Australia on the other. It therefore may, in the present state of our knowledge upon the subject, be well to caution navigators not to cross the prime meridian to the south of 45°; and then, if they intend to go as far south as 55°, to aim from this crossing to strike that parallel, or the highest they intend to reach, near the meridian of 40° E.

I do not venture lightly or without reflection to differ with the Hydrographic Office of England, in matters of this sort. That is high authority, I am aware. I know the distinguished officer who has presided over it with such signal ability for so many years. Navigation owes him much, and I have the highest admiration and respect for him, both as an officer and a man. I therefore allude to the work of his office, upon which he has conferred well-earned renown, and to the opinions uttered by it, with the utmost respect. The object that I, and those who co-operate with me, have in view, is the object for which the great Hydrographic Office of the world—that of the British Admiralty—was established and is maintained, viz: the improvement of navigation, the benefit of commerce, and the good of the seafaring community.

Our objects being the same, therefore, when my investigations, which have so far been carried on through a separate and independent system of observations, lead me to results which differ from conclusions by others, I may surely be permitted to announce these results; and if they differ from admiralty authorities, I may also be permitted, without offence, to allude to that difference, and to show, by facts and observations, not which side is entirely right—for that is not always the case with either—but which is the less wrong.

The following is directly to the point:—

"Before sailing," Captain Albert Bowen, in the abstract log of the barque Gem of the Sea, from New York to Australia, in 1853, says: "I obtained an English Directory for the Indian Ocean and Australia published in 1843, which recommended crossing in the latitude of 39° south, which I followed, and which I think greatly prolonged my passage. I would advise going as far south as 48°, where they will get a strong, steady wind from the westward. By crossing in 39°, I very unexpectedly got a great deal of northerly and easterly wind, with more calms and light winds than I ever experienced before. I have crossed the Indian Ocean both in summer and winter, but never experienced half so much easterly winds in all before."

In further proof that the route recommended in the *Sailing Directions* of the Admiralty is too far to the north, and as an illustration of the advantages of the route which I advise, I have prepared the following tables. It appears from them that there is no longer room for difference of opinion as to the advantages of going farther south than 39°–40°. How much farther, though, still remains to be decided. But, so far as the facts before us go, they justify the assertion that, for every degree you go south of the admiralty route, you gain three days on the average, until you reach the parallel of 45°–6°, for the averages of the table are not below this parallel; and I believe it will turn out that the best streak of wind, on the long run, is to be found between 45° and 50° S. It seems to be almost as steady, between these parallels, from the westward, as it is anywhere from the east, between the trade-wind parallels of 15° and 20°.

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Crossings to Australia, South

NAME OF VESSEL.	Whence.	Days from parallel of St. Roque to the variable winds.	Date of crossing the parallel of St. Roque.	LATITUDE OF CROSSING MERIDIANS WEST. 30°.	20°.	10°.	Latitude of crossing the meridian of Greenwich.
Scotia	London	16	Nov. 6, 1850			37.0	38.0
Maria	Rio	12	Feb. 25, 1853	32.0	37.0	39.0	39.0
Helena	New York	12	July 8, 1852	29.0	35.0	35.0	37.0
Nightingale	Boston	13	Nov. 27, "	14.0	22.0	36.0	39.0
Leontine	Bremen	9	June 18, 1849	33.0	36.0	36.0	36.0
Miltiades	Liverpool	9	Aug. 21, 1852	23.0	23.0	35.0	39.0
Audubon	New York	12	Aug. 8, 1853	33.0	38.0	40.0	41.0
Tarolinta	N. Y. *via* Rio	8	July 23, "	41.0	42.0	43.0	44.0
Seargo	New York	17	Jan. 21, "	16.0	31.0	34.0	36.0
Magnolia	Boston	14	Nov. 4, "	26.0	39.0	40.0	40.0
Lady Arabella	New York	15	" 15, "	20.0	30.0	34.0	36.0
Angelique	"	22	" 28, "	16.0	37.0	40.0	41.0
Humboldt	"	18	Jan. 2, 1854	25.0	42.0	44.0	45.0
Auckland	"	21	Sept. 21, 1853	34.0	41.0	49.0	53.0
Siri	"	20	Nov. 3, "	34.0	40.0	41.0	42.0
Nimrod	Rio						
Helena	New York	18	Sept. 20, "	35.0	37.0	38.0	41.0
Fly-Away	"	13	" 25, "	10.0	30.0	38.0	37.0
Lady Franklin	"	15	Oct. 18, "		25.0	29.0	35.0
Red Jacket	Liverpool	10	May 31, 1854	27.0	32.0	31.0	34.0
Oriental*	Boston	13	Oct. 11, 1853	16.0	38.0	42.0	47.0
Iconium	Richmond, Va.	14	Mar. 8, 1854	21.0	34.0	40.0	41.0
Parana	New York	14	Dec. 10, 1853	18.0	27.0	38.0	40.0
Malay	"	14	Nov. 22, "	32.0	39.0	44.0	45.0
Europa	"	10	July 18, 1852	23.0	30.0	34.0	36.0
Averages		14.3		26.14	34.08	38.11	40.05

* On the 25th of November, 1853, in lat. 53° 10′ S., long. 74° 15′ to 74° 40′ E., Capt. Heard, in the Oriental, reports the discovery of an island, which he named "Heard's Island."

of the Parallel of 40° *S.*

LATITUDE OF CROSSING MERIDIANS EAST.													Days from St. Roque to Australia.	Days from port to Australia.
10°.	20°.	30°.	40°.	50°.	60°.	70°.	80°.	90°.	100°.	110°.	120°.	130°.		
40.0	41.0	43.0	44.0	45.0	45.0	45.0	46.0	47.0	47.0	47.0	48.0	49.0	65	101
39.0	40.0	40.0	40.0	40.0	40.0	41.0	41.0	40.0	40.0	40.0	40.0	40.0	61*	
38.0	38.0	40.0	40.0	41.0	42.0	40.0	40.0	40.0	39.0	40.0	40.0	41.0	52	80
40.0	40.0	42.0	44.0	45.0	45.0	45.0	45.0	45.0	44.0	43.0	42.0	42.0	51	90
38.0	39.0	41.0	42.0	42.0	42.0	42.0	42.0	40.0	39.0	39.0	38.0	38.0	53	87
43.0	44.0	45.0	45.0	46.0	46.0	44.0	44.0	44.0	43.0	44.0	44.0	43.0	56	100
41.0	40.0	42.0	43.0	43.0	43.0	42.0	42.0	42.0	42.0	41.0	43.0	40.0	69	105
42.0	43.0	45.0	46.0	46.0	47.0	47.0	47.0	47.0	47.0	47.0	45.0	41.0	59*	
39.0	40.0	41.0	43.0	44.0	44.0	44.0	45.0	44.0	44.0	44.0	42.0	41.0	59	96
41.0	42.0	42.0	42.0	40.0	41.0	41.0	41.0	41.0	41.0	41.0	40.0	40.0	64	107
38.0	39.0	39.0	42.0	43.0	44.0	45.0	44.0	44.0	44.0	44.0	44.0	42.0	69	115
41.0	42.0	42.0	43.0	44.0	44.0	44.0	43.0	43.0	43.0	43.0	42.0	41.0	65	106
46.0	47.0	48.0	49.0	50.0	50.0	51.0	51.0	50.0	49.0	48.0	47.0	43.0	57	96
53.0	53.0	51.0	52.0	52.0	53.0	53.0	52.0	52.0	53.0	54.0	49.0	44.0	64	101
42.0	42.0	42.0	41.0	41.0	42.0	42.0	42.0	42.0	42.0	42.0	41.0	41.0	65	115
50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	49.0	44.0	44*	
42.0	41.0	43.0	43.0	44.0	45.0	45.0	46.0	47.0	46.0	45.0	45.0	42.0	48	95
38.0	37.0	43.0	43.0	43.0	43.0	43.0	42.0	42.0	43.0	43.0	41.0	39.0	46	80
39.0	40.0	43.0	44.0	45.0	46.0	46.0	45.0	44.0	44.0	44.0	44.0	42.0	61	107
40.0	45.0	46.0	50.0	51.0	52.0	52.0	50.0	49.0	49.0	47.0	47.0	42.0	42	69
50.0	52.0	51.0	51.0	51.0	54.0	53.0	53.0	53.0	50.0	48.0	48.0	44.0	72	131
43.0	43.0	42.0	44.0	46.0	47.0	46.0	45.0	44.0	44.0	44.0	43.0	41.0	67	97
41.0	43.0	44.0	45.0	45.0	45.0	48.0	46.0	46.0	47.0	46.0	46.0	46.0	57	89
46.0	48.0	49.0	49.0	49.0	48.0	46.0	46.0	46.0	46.0	46.0	46.0	45.0	51	99
39.0	40.0	41.0	42.0	41.0	41.0	41.0	41.0	41.0	40.0	40.0	41.0	43.0	61	107
41.37	42.45	43.48	44.41	45.02	45.19	45.26	45.10	44.55	44.38	44.24	43.40	42.10	54.0	98.3

* From Rio de Janeiro.

Crossings to Australia,

NAME OF VESSEL.	Whence.	Days from parallel of St. Roque to the variable winds.	Date of crossing the parallel of St. Roque.	LATITUDE OF CROSSING MERIDIANS WEST.			Latitude of crossing the meridian of Greenwich.
				30°.	20°.	10°.	
Thomas Arbuthnot	Plymouth	12	Nov. 1, 1848	10.0	30.0	35.0	38.0
Thomas Strickland	London	9	Apr. 29, 1849		26.0	30.0	34.0
Leontine	Bremen	12	May 19, 1848	32.0	34.0	34.0	34.0
Gem of the Sea	New York	28	May 21, 1853	30.0	34.0	37.0	37.0
Yarmouth	"	18	" 8, "	23.0	30.0	33.0	36.0
Pride of the Sea	"	10	Aug. 7, "	25.0	32.0	34.0	36.0
Candace	"	15	Mar. 7, "	32.0	34.0	37.0	37.0
Oregon	"	24	Apr. 23, "	25.0	31.0	34.0	37.0
Sartelle	N. Y. *via* Rio	9	" 1, "	33.0	34.0	35.0	36.0
Aura	New York	13	Aug. 24, "	34.0	38.0	39.0	37.0
Texas	"	37	June 17, "	37.0	37.0	37.0	37.0
Vandalia	Baltimore	19	Apr. 27, "	15.0	23.0	32.0	37.0
Daniel Webster	New York	20	Mar. 19, "	18.0	28.0	31.0	31.0
Robertina	Glasgow	17	Nov. 5, "	25.0	31.0	35.0	38.0
Retriever	St. Johns, N.B.	28	Jan. 31, 1854		31.0	33.0	36.0
Rockland	New York	17	May 27, 1853	31.0	29.0	30.0	36.0
Europa	"	9	" 5, 1851	24.0	31.0	34.0	37.0
Imaum	"	14	Feb. 5, 1853	19.0	27.0	28.0	37.0
Averages		17.3		25.8	31.1	33.2	36.2

* This table includes only those vessels that have taken the admiralty route with the Wind and Current Charts on board; consefore, resolves itself purely into a question of route—*i. e.*, winds, currents, and distance. The difference is 16½ days (28 per cent.), in the admiralty route, with those that went the admiralty route *blind*, without any of the knowledge which these Charts give, we shall by the latter, or a saving of 5 days (6⅔ per cent.) in consequence of the knowledge derived from the Charts alone. Add to this the half the way to Australia.

*by the Admiralty Route.**

LATITUDE OF CROSSING MERIDIANS EAST.													Days from St. Roque to Australia.	Days from port to Australia.
10°.	20°.	30°.	40°.	50°.	60°.	70°.	80°.	90°.	100°.	110°.	120°.	130°.		
37.0	38.0	38.0	39.0	39.0	39.0	39.0	39.0	39.0	40.0	40.0	40.0	41.0	67	103
38.0	39.0	39.0	39.0	39.0	41.0	40.0	39.0	40.0	41.0	43.0	45.0	47.0	71	108
36.0	37.0	38.0	38.0	38.0	38.0	39.0	39.0	40.0	39.0	39.0	37.0	36.0	64	107
37.0	37.0	38.0	38.0	39.0	38.0	38.0	38.0	37.0	37.0	37.0	39.0	40.0	72	105
37.0	38.0	40.0	39.0	40.0	40.0	40.0	38.0	37.0	38.0	39.0	40.0	40.0	89	132
37.0	38.0	38.0	38.0	39.0	39.0	39.0	39.0	40.0	40.0	40.0	40.0	40.0	55	86
38.0	38.0	37.0	37.0	37.0	38.0	38.0	39.0	39.0	39.0	39.0	39.0	39.0	85	101
37.0	38.0	39.0	38.0	38.0	37.0	36.0	39.0	39.0	41.0	41.0	41.0	39.0	70	103
37.0	38.0	39.0	39.0	40.0	41.0	40.0	40.0	39.0	39.0	37.0	39.0	39.0	82†	
40.0	39.0	38.0	37.0	41.0	42.0	42.0	41.0	41.0	41.0	41.0	40.0	41.0	77	110
37.0	37.0	38.0	38.0	40.0	40.0	40.0	38.0	39.0	38.0	39.0	38.0	39.0	68	105
38.0	39.0	40.0	41.0	40.0	41.0	42.0	40.0	41.0	41.0	41.0	40.0	39.0	80	128
34.0	37.0	38.0	38.0	38.0	39.0	39.0	39.0	39.0	39.0	38.0	39.0	40.0	74	109
38.0	40.0	40.0	40.0	40.0	40.0	40.0	39.0	39.0	39.0	39.0	39.0	40.0	78	133
37.0	40.0	40.0	40.0	40.0	40.0	39.0	38.0	38.0	38.0	40.0	39.0	39.0	99	153
39.0	40.0	39.0	37.0	37.0	38.0	38.0	39.0	39.0	39.0	39.0	40.0	40.0	75	113
38.0	39.0	40.0	41.0	39.0	37.0	38.0	38.0	40.0	40.0	38.0	40.0	41.0	74	119
39.0	39.0	39.0	39.0	39.0	37.0	37.0	37.0	37.0	38.0	39.0	40.0	40.0	79	109
37.4	38.4	38.8	38.7	39.0	39.2	39.1	38.8	39.1	39.3	39.4	39.7	40.0	75.1	113

quently, they had before them all the information as to winds, &c., which those who went further south had, and the comparison, there-
favor of the new route, from the parallel of St. Roque alone. Now, if we compare those vessels that had the Charts, and still preferred
have—supposing the two sets of vessels to be equal in all other respects—an average of 75 days for the former, against about 80
saving effected by the route as above, and we have a gain of 34 or 35 per cent. of the time usually occupied on a little more than one

† From Rio de Janeiro.

There is still room for improvement; and that those interested in ships, commerce, and navigation, may conceive how rich with good results, and with the promise of more, this field is, they should not forget what has been done for that part of the route which lies in the North Atlantic. To give this route to Australia a fair trial, vessels should not only take the Wind and Current Charts for their guide along that part of the route which lies between the meridians of the Cape of Good Hope and Melbourne, but they should take them for their guide all the way. I make this caution because only a few of the vessels of the table have done this. They either did not take the new route to the equator, and thence to the parallel of St. Roque; or, having followed it thus far, they did not continue to follow it for the rest of the voyage. The abstract logs of 365 vessels, taken at random, that have followed the new route through the North Atlantic to the fair way of St. Roque, have been discussed, pp. 456–67. The mean gives 34 days as the average passage from the United States to the parallel of St. Roque. The present average from the Channel and the western coast of England to the same parallel, is about 42 days; there is reason to believe that this may be reduced five or six days *at least.* This reduction, if it takes place, will apply directly to the Australia route from Europe, for that part of it which lies north of the parallel of St. Roque, is common alike to all vessels, whether bound to Australia, India, Rio, or California.

Now, with the view of illustrating the advantages of going to the southward of the admiralty route, let us take from the table, as per new route, the passage from the parallel of St. Roque to Australia, made by those vessels that have gone south of 45°. There are 11 of them only, and their average time is 58 days; so that we are, judging from the results so far, entitled to say that, when the prevailing winds and currents to be encountered on the voyage from England or the English Channel to Australia shall come to be understood, and when the routes recommended according to such knowledge shall be properly followed *all the way*, the average duration of the voyage, so far from being 124 days, as it now appears to be by the admiralty route, or 98 days, as it now appears to be by the vessels that have the Wind and Current Charts on board, will probably be less than 95 days from America, and not more than 91 or 92 from England or the Channel.

And now comes the striking feature of this contrast. All the vessels that had the Charts, but still preferred the admiralty route, had, on the average, from the parallel of St. Roque to Australia, a longer passage than the longest of those that took the Charts for their guide, and went south of 45°. That is, those that kept to the north of 41° had, counting only from the parallel of St. Roque, passages varying from 55 to 99 days, but averaging 75. Whereas, those that went south of 45°, and took the Charts for their guide, had, from the same parallel, passages varying from 42 to 72 days only, and averaging 58.

I do not mean to imply that vessels going south of 45° will *never* have long passages—I do not pretend to say that for any route. It should be recollected that, in laying down rules of conduct in Sailing Directions, the rules laid down are intended to suit the *majority* of cases. The exceptions may be many; but, when compared with the whole, they will be neither numerous nor glaring enough to alter the rule.

Abstract Log of the Ship Humboldt (G. B. Cook). *From off St. Roque to Port Philip*, 1854.

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Variation observed.	Bar.	Ther. 9 A. M.		Winds.		
						Air.	Water.	First part.	Middle part.	Latter part.
Jan. 3	8°50′S.	33°30′W.	1, S. S. W.	7° W.	29.65	82°	80°	S. E.	S. E.	E. S. E.
4	11 26	34 00	None	8	29.65	82	80	E. S. E.	E. S. E.	E. S. E.
5	14 41	34 00	1, W. N. W.	8	29.65	82	80	E. S. E.	East	East
6	17 28	34 00	1, W. N. W.	8	29.70	82	80	E. S. E.	East	E. N. E.
7	19 54	33 24	0.8, W. N. W.	8	29.75	82	80	E. N. E.	E. N. E.	E. N. E.
8	21 26	33 16	None	8	29.75	82	80	E. N. E.	N. E.	N. E.
9	21 50	33 17	None	7	29.75	82	80	S. W.	Calm	N. W.
10	22 21	33 17	None	9	29.61	80	80	Calm	N. W. to E.	Calm
11	24 13	33 00	.5, N. N. E.	9	29.51	77	78	North	North	W. S. W.
12	25 13	29 10	None	9	29.51	77	78	S. W.	S. S. W.	South
13	26 00	29 00	None	9	29.51	76	77	S. S. E.	S. S. W.	Calm
14	28 24	28 24	None	10	29.70	76	71	E. S. E.	East	E. N. E.
15	31 00	27 35	.5, W.	10	29.80	76	72	N. N. E.	N. N. E.	North
16	33 38	27 00	None	10	29.80	72	67	North	S. by W.	N. N. W.
17	34 14	25 43	None	10	29.80	65	67	N. W.	South	Calm
18	35 17	25 16	None	10	29.90	69	67	Calm	S. E.	East
19	38 16	24 30	1, W. N. W.	10	29.40	69	64	N. E.	North	North
20	40 06	24 00	.5, S. E.	10	29.20	69	60	N. to W.	Calm	N. W.
21	42 17	21 10	None	11	29.20	59	54	North	N. W.	N. W.
22	43 31	17 00	1.6, N. W. by W.	11	29.60	60	50	N. W.	N. W.	N. W.
23	44 17	13 45	1.6, W. N. W.	14	29.75	54	47	N. W.	W. N. W.	W. N. W.
24	44 46	9 30	.5, W. by N.	17	29.80	52	48	N. W.	N. W. by N.	N. N. W.
25	44 49	5 00	1, N. E. by E.	21	26.80	54	50	N. W.	N. W.	N. W.
26	44 59	1 00	.5, W. N. W.	23	29.60	54	46	N. W.	N. W.	N. N. W.
27	44 59	0 17 E.	E. S. E.		29.50	54	46	N. N. E.	Calm	S. S. E.
28	44 32	0 54	178 in		29.50	52	46	S. E.	Calm	S. E.
29	45 20	6 09	3 days	23	29.70	52	46	S. S. W.	S. W.	N. W.
30	45 51	7 01	None	28	29.80	50	46	S. W.	Baffling	North
31	46 15	14 00	.5, E. S. E.	30	29.90	48	45	N. W.	N. N. W.	North
Feb. 1	46 45	16 40	.5, E. S. E.	30	29.85	48	43	North	Calm	North
2	47 00	18 40	1, E. S. E.	31	29.90	48	43	Calm	N. W.	N. W.
3	47 20	23 10	1, W. N. W.	32	29.50	48	41	N. N. W.	N. W.	S. W.
4	47 30	27 33	1.5, W. N. W.	35	29.50	42	42	S. W.	W. S. W.	W. N. W.
5	47 50	32 15	1, W. N. W.	40	29.50	44	44	W. S. W.	W. N. W.	West
6	48 11	36 40	None	41	29.50	44	41	W. N. W.	N. W.	N. W.
7	48 56	41 38	.8, E. S. E.	41	29.60	46	40	N. W.	N. W. by N.	N. W. by N.
8	49 30	47 20	1.5, E. S. E.	41	29.50	44	38	N. W.	N. W. by N.	N. W. by N.
9	50 03	53 00	None	42	29.30	44	38	N. W.	N. N. W.	N. N. W.
10	50 27	59 00	D. R.	42	29.80	44	39	N. W.	S. W. by S.	N. W.
11	50 37	63 00	D. R.	42	29.60	40	38	N. W. by N.	N. W. by N.	N. W.
12	50 43	66 40	40, W. in 3 days	41	29.80	40	39	N. W.	N. W.	N. W.
13	50 51	72 23	D. R.	41	29.70	41	38	N. W.	N. N. W.	N. W.
14	50 53	76 38	1, W.	40	29.60	40	37	N. W.	N. W.	North
15	50 47	81 29	D. R.	40	29.70	40	39	North	N. E.	East
16	49 47	86 14	D. R.	40	28.31	40	39	S. E. to S.	W. S. W.	West
17	49 07	92 00	None	37	28.90	38	43	W. N. W.	W. N. W.	W. N. W.
18	48 23	97 36	5, E. N. E.	35	28.70	38	42	W. N. W.	W. N. W.	W. N. W.
19	47 45	102 50	None		29.20	44	43	W. S. W.	W. S. W.	West
20	47 12	108 23	D. R.	25	29.40	48	44	W. N. W.	N. W.	N. W.
21	47 45	113 41	28 miles in 2	17	29.20	50	49	N. W.	N. N. W.	W. N. W.
22	46 55	119 00	days. D. R.	17	28.81	50	49	N. N. W.	N. N. W.	N. by W.
23	45 25	123 32	None	11	29.20					
24	44 15	128 00	None	None	29.50	52	53	W. N. W.	North	N. N. W.
25	42 40	132 00	D. R.	None	29.61	52	49	N. W.	N. W.	N. W.
26	40 46	136 29	1.5, E. N. E.	7 E.	29.80	52	56	W. S. W.	S. S. W.	S. S. W.
27	39 18	140 15	1, W.	9	29.80	52	59	S. S. W.	South	S. S. E.
28	Off Cape		1.5, W.	9	29.80	52	59	S. S. E.	S. S. W.	S. S. W.

Jan. 3. Good weather; fine breeze.

Jan. 4. Good weather; fine breeze.

Jan. 5. Good weather; fine breeze.

Jan. 6. Good weather; fine breeze.

Jan. 7. First, good breeze; middle and latter parts, light winds.

Jan. 8. Light airs and pleasant.

Jan. 9. Light airs and pleasant.

Jan. 10. Light airs with rain squalls.

Jan. 11. Commences light airs with rain; ends good breezes.

Jan. 12. Strong winds and head sea; pleasant.

Jan. 13. Light variable winds, calms, and heavy rain; swell from N. W.

Jan. 14. Moderate and pleasant; smooth water.

Jan. 15. Moderate and pleasant; smooth water.

Jan. 16. Moderate and cloudy.

Jan. 17. Wind hauled suddenly to south; thick fog; rain.

Jan. 18. Light airs and pleasant.

Jan. 19. Commences airs; ends strong breezes and cloudy; rain.

Jan. 20. Commences strong breezes; ends light winds.

Jan. 21. Strong winds and pleasant weather.

Jan. 22. Strong squalls and good breezes; swell from N. W.

Jan. 23. Moderate and cloudy.

Jan. 24. Moderate and pleasant; smooth water.

Jan. 25. Moderate and pleasant; ends cloudy.

Jan. 26. Moderate and foggy; smooth.

Jan. 27. Light airs and rainy; saw whales.

Jan. 28. Light airs and rainy.

Jan. 29. Moderate breezes and cloudy.

Jan. 30. Moderate breezes and cloudy.

Jan. 31. Light airs and calms.

Feb. 1. Light airs; middle part, foggy.

Feb. 2. Light airs and calms; foggy.

Feb. 3. Increased to a strong breeze in the morning; in light sails. Barque Storm came up and passed us at 7 P. M., having left New York 20 days after us. She kindly threw us some newspapers on board *en passant.*

Feb. 4. Fresh breeze and passing squalls. Barque Storm in sight till 4 P. M., on the starboard bow.

Feb. 5. Good breeze and passing squalls. Passed a ship on port beam going the same way.

Feb. 6. Fresh breeze and cloudy; rolling sea after us.

Feb. 7. Fresh breeze and cloudy; rolling sea; two whales.

Feb. 8. Fresh breeze and cloudy; rolling sea.

Feb. 9. Strong steady winds and hazy weather.

Feb. 10. Commences rainy; good breezes throughout; ends clear.

Feb. 11. Strong steady breeze and cloudy.

Feb. 12. Moderate breeze and cloudy; at 2 A. M., smell of guano.

Feb. 13. Commences moderate breeze; middle and latter parts, strong winds.

Feb. 14. First and latter parts, good breezes; middle, light.

Feb. 15. Moderate and foggy; ends light rain; saw kelp.

Feb. 16. Commences rainy, increases to a gale, and backs to westward; scud under double reefed fore and main topsails and foresail; ends in a gale with a very heavy sea, squalls of hail and snow; saw patches of kelp; Aurora Australis visible in the southern heavens.

Feb. 17. Continues the same, under single reefed fore and main topsails, foresail and main topgallant sail; patches of kelp.

Feb. 18. Continues the same heavy sea.

Feb. 19. Moderates gradually down; made all sail.

Feb. 20. Fine breezes and cloudy; all sail set.

Feb. 21. Increases to a gale, and moderates to a strong breeze.

Feb. 22. Commences moderate, increasing to a gale in the morning with squalls and rain; uncertain.

Feb. 23. Commences moderate, increased to a gale in the morning.

Feb. 24. Commences moderate; middle and latter part, strong winds.

Feb. 25. Good breeze with passing squalls.

Feb. 26. Strong breeze and squally; ends pleasant.

Feb. 27. Moderate breezes and passing squalls.

Feb. 28. Moderate breezes and passing squalls. At 8 P. M. civil account, anchored inside the Heads, off the Shortland-bluff Lighthouse, not being able to procure a pilot.

This ship is 689 tons, and carries about 1,500 measurement. She has now on board 600 in feet of lumber, and 90 in bricks.

I have given much attention to observations for variations, whenever the weather was sufficiently clear. I find it quite different from what we find in charts and books.

Respectfully, your obedient servant,

(Signed) GEORGE B. COOKE.

PORT PHILIP,

February 28, 1854.

Abstract Log of the Ship Miltiades (JOHN HENRY). *From off St. Roque to Melbourne*, 1852.

Date.	Latitude at noon.	Longitude at noon.	Bar.	THER. 9 A. M.		WINDS.		
				Air.	Water.	First part.	Middle part.	Latter part.
Aug. 22	8° 36′ S.	26° 20′ W.	30.00	79°	64°	S. S. E.	S. E. by S.	S. E.
23	11 27	28 15	29.96	76	64	S. S. E.	S. E. by S.	S. S. E.
24	14 16	29 44	29.90	75	63	S. E. by S.	S. E. by S.	S. S. E.
25	16 44	31 00	29.86	73	64	S. E. by E.	S. E. by S.	S. S. E.
26	18 46	31 52	29.80	70	66	S. E.	S. E. by S.	S. E. by E.
27	20 07	32 06	29.93	72	65	E. S. E.	East	East
28	20 44	31 56	29.94	73	64	S. E. to E.	East	S. E. to E.
29	22 57	30 15	29.88	76	63	N. E.	East	N. E.
30	24 49	28 18	29.90	79	62	N. N. E.	N. by W.	N. N. W.
31	26 50	26 14	29.88	78	64	N. N. W.	N. N. W.	N. N. W.
Sept. 1	29 03	23 08	29.84	76	63	N. N. W.	N. N. W.	W. N. W.
2	29 21	19 11	29.92	72	66	W. N. W.	W. S. W.	S. W.
3	29 45	17 20	29.90	71	65	W. S. W.	S. W.	S. W.
4	31 00	15 35	29.88	73	62	Westward	Westward	North
5	33 07	12 39	29.87	72	64	N. N. W.	N. N. W.	S. W.
6	35 00	9 56	29.91	68	61	S. W. by S.	S. W. by S.	S. W. by S.
7	36 26	6 19	29.74	60	59	W. S. W.	W. S. W.	W. S. W.
8	37 34	2 35	29.70	59	59	W. S. W.	S. W.	S. W.
9	38 59	0 54 E.	29.74	58	59	N. W.		
10	40 54	4 30	29.76	59	59	W. N. W.	N. W.	N. W.
11	42 05	7 52	29.74	61		N. W.	N. W.	N. W.
12	43 26	12 07	29.78	60		N. W.	N. W.	N. W.
13	43 24	14 35	29.74	58		N. W. by W.	Calm	Westward
14	43 48	18 20	29.72	56		S. W.	S. W.	S. W.
15	43 42	21 00	29.70	46		S. W.	S. W.	S. W.
16	44 13	23 15	29.68	45		Westward	Westward	S. W.
17	44 37	27 37	29.54	44		W. S. W.	W. S. W.	Westward
18	44 38	32 55	29.54	44		W. S. W.	W. S. W.	W. S. W.
19	44 28	37 02	29.50	43		W. by N.	W. by N.	W. S. W.
20	45 05	41 27	29.57	46		N. W. by W.	N. W.	W. S. W.
21	45 50	46 06	29.62	47		N. N. W.	N. N. W.	N. W.
22	46 05	50 07	29.47	45		W. N. W.	N. W.	N. N. W.
23	46 38	54 12	29.13	40		N. by W.	North	N. W.
24	46 32	57 00	29.13	42		N. W.	Calm	W. N. W.
25	46 05	61 37	29.13	40		West	West	W. S. W.
26	45 06	66 40	29.10	39		S. W.	S. W.	S. W. by W.
27	43 59	70 26	29.20	39		S. W.	S. W.	S. W.
28	44 00	74 17	29.19	40		W. S. W.	West	N. W.
29	44 00	78 51	29.20	40		N. W.	N. W.	N. W.
30	44 27	83 47	29.20	39		W. N. W.	W. N. W.	W. N. W.
Oct. 1	43 52	88 14	29.18	41		W. N. W. to	N. W.	N. W.
2	43 45	93 11	29.20	40		N. W.	N. W.	N. W.
3	42 44	96 42	29.15	39		W. S. W.	W. S. W.	W. S. W.
4	42 55 D. R.	101 00 D. R.	29.17	39		W. S. W.	W. S. W.	W. S. W.
5	42 24	105 39	29.20	41		West	West	West
6	43 35	109 30	29.50	44		W. N. W.	W. N. W.	W. N. W.
7	43 27	114 21	29.74	43		W. S. W.	W. S. W.	W. S. W.
8	43 22	118 30	29.70	41		W. S. W. to	S. by W.	S. by W.
9	43 46	122 50	29.80	43		S. W.	S. W.	S. W.
10	43 59	127 30	29.80	45		S. W.	S. W.	S. W.
11	42 55	131 53	29.76	46		S. S. W.	S. S. W.	South
12	41 59	136 04	29.80	48		South	S. W.	W. by N.
13	40 36	140 30	29.87	50		W. N. W.	W. N. W.	W. N. W.
14	39 48	143 52	29.90	49		N. W.	N. W.	N. W.
15		142 55				W. S. W.		

Aug. 22. First part, strong; middle part, light; latter part, fresh. A boy, named Frater, belonging to a passenger, died; committed his body to the deep.

Aug. 23. First part, strong; middle part, squally; latter part, strong.

Aug. 24. First part, squally; middle part, strong and squally; latter part, strong. Very squally; carried away jib-boom, cleared the wreck, and run out another.

Aug. 25. First part, squally; middle part, squally; latter part, squally. I do not recollect having ever experienced such squally weather in these latitudes.

Aug. 26. First part, squally; middle part, squally; latter part, fresh.

Aug. 27. First part, light; middle part, light; latter part, light. I think we are about to lose the trades.

Aug. 28. First part, light; middle part, light; latter part, light. Twelve children unwell.

Aug. 29. First part, light; middle part, light; latter part, light.

Aug. 30. First part, fresh; middle part, ———; latter part, ———; sultry weather.

Aug. 31. Wind steady, and clear sky.

Sept. 1. Strong; exchanged signals with British barque Statesman, 56 days out, Shields to Aden. Heavy lightning at 7 P. M. Latter part, strong gale.

Sept. 2. Latter part, strong; shortened sail.

Sept. 3. First part, ———; middle part, ———; latter part, ———.

Sept. 4. First part, light winds; latter part, winds falling, light and hauling to northward.

Sept. 5. First part, strong; middle part, strong; latter part, at 6 A. M., wind shifted to S. W. suddenly; rain at intervals.

Sept. 6. First, middle, and latter parts, strong; passengers all well.

Sept. 7. First part, strong, with hail; middle part, do.

Sept. 8. First part, strong gale; middle and latter parts, hail at intervals. A heavy rolling sea over from S. W. Ship rolling badly; broke the marine thermometer.

Sept. 9. First part, wind hauling.

Sept. 10. First part, fresh; middle and latter parts, fresh; heavy rolling swell from S. W.

Sept. 11. First and middle parts, strong; latter part, moderate; at 7 P. M. carried away F. T. mast studding-sail boom.

Sept. 12. First part, moderate; middle, freshening; latter part, strong; damp, cold weather.

Sept. 13. First part, fresh and rainy; middle part, calm; latter part, light, and rain; damp, cold weather.

Sept. 14. Cold, disagreeable weather.

Sept. 15. First, middle, and latter parts, light. Very cold.

Sept. 16. Wind veering to westward. Very cold, damp weather.

Sept. 17. A dreadful heavy sea from W. S. W.

Sept. 18. First, middle, and latter parts, strong gale; double-reefed the topsails.

Sept. 19. First and middle parts, strong gale; passing showers of rain and sleet.

Sept. 20. First, middle, and latter parts, strong gales; squally weather throughout.

Sept. 21. Middle and latter parts, strong; squally, disagreeable weather.

Sept. 22. First, middle, and latter parts, strong gales; cold weather, with small snow.

Sept. 23. First part, strong; middle part, hard, heavy snow squalls; at 8 P.M., made the Island of Croretes or Marion, bearing N. E. about three miles; the position given by Norie is lat. 46° 45′ south, long. 48° 00′ E. That given by Roper, 46° 9′ S., long. 50° 28′ E.; by lunars and chronometers, I make the longitude 50° 40′ E., and latitude, carried on from noon, about 46° 12′ S.

Sept. 24. First part, light winds; middle part, calm; latter part, strong snow showers at intervals.

Sept. 25. First, middle, and latter parts, strong gales; showers of hail; heavy rolling sea in all directions.

Sept. 26. First and middle parts, strong breezes; latter part, gale; bitter cold; snow and hail; several cape pigeons flying about.

Sept. 27. First, middle, and latter parts, strong gales; ship rolling fearfully; snow and hail.

Sept. 28. Moderating. Cold, damp weather; slight hail.

Sept. 29. First part, light; middle part, increasing; latter part, moderate; very disagreeable weather; snow and hail at intervals.

Sept. 30. Moderate. Rain at intervals.

Oct. 1. Squally, with showers of hail.

Oct. 2. Heavy rolling sea from S. S. W.

Oct. 3. Heavy sea, with rain and snow; weather very cold.

Oct. 4. Strong gales and hazy; very cold.

Oct. 5. Strong gales, with small rain at intervals.

Oct. 6. Heavy rain and squalls.

Oct. 7. Heavy snow squalls.

Oct. 8. Heavy snow and hail showers alternately.

Oct. 9. Strong breezes; weather more mild.

Oct. 10. Weather mild.

Oct. 11. Strong breezes; fair, clear weather.

Oct. 12. Fresh breezes; weather clear and mild.

Oct. 13. Strong breezes; weather, first part, clear; latter part, squally.

Oct. 14. First, middle, and latter part, strong breezes; weather hazy and squally. Observations taken by chronometer.

Oct. 15. At 4 P. M., made King's Island, Bass's Straits, Cape Otway, N. by E.; the wind came from N. E.; beat up for the land at daylight; made the land north of Cape Otway; wind hauled to S. W.; ran up the coast; at 2 P. M., ran into and passed the anchorage off Shortland's Bluff; no pilot offering, I kept right on; at 5 P. M., clear of all danger, and safely into Port Philip; wind came down from north; employed beating up. Longitude to-day taken by lunar observation.

Oct. 16. Saturday morning, at 9 A. M., came to anchor in Hobson's Bay, after a passage of 100 days 4 hours exactly, from the Mersey, with 308 government emigrants on board; twelve children, under one year of age, died during the voyage; thirteen were born—thus landing one more alive than we took on board.

(Signed) JOHN HENRY.

Abstract Log of the Bremen Ship Leontine (W. T. ARIAANS). *Bremen to Port Adelaide, South Australia*, 1848.

Date.	Latitude at noon.	Longitude at noon.	Bar.	Ther. 9 A. M. Air.	Ther. 9 A. M. Water.	Winds. First part.	Winds. Middle part.	Winds. Latter part.	Remarks.
1848									
June 9	25°42′S.	41°06′W.	30.0	69°	69°	N. E.	N.	N.	Brisk and cloudy.
10	27 54	37 41	29.9	68	69	N. E.	N. E.	N. E.	Brisk and cloudy.
11	29 49	34 50	29.9	68	69	N. N. E.	N. N. E.	N. E.	Brisk and cloudy.
12	31 44	31 16	29.9	68	69	N.	N.	N.	Brisk and cloudy.
13	33 05	27 09	30.0	68	68	N.	N.	N.	Brisk and cloudy.
14	34 18	22 57	30.0	68	68	N.	N.	N.	Very brisk and pleasant.
15	No obs.	No obs.	29.8	68	68	N.	N. N. W.	N. N. W.	Very brisk with rain.
16	No obs.	No obs.	30.0	68	68	N. N. W.	N. W.	N. W.	Very brisk with rain.
17	34 22	9 19	30.0	68	68	N. N. W.	N. N. W.	N. N. W.	Very brisk and clear.
18	34 16	4 39	30.0	68	68	N. N. W.	N. N. W.	N. N. W.	Very brisk and clear.
19	34 22	0 35	30.0	69	68	N. N. W.	N. N. W.	N. N. W.	Moderate; fine weather.
20	34 36	1 19 E.	30.0	69	68	N. W.	N. W.	N. W.	Moderate; fine weather.
21	35 18	4 30	30.0	69	68	N. W.	N. W.	N. W.	Moderate; fine weather.
22	36 06	8 11	30.0	67	67	N. W.	N. W.	N. W.	Moderate; fine weather.
23	36 43	12 30	30.0	67	67	N. W.	N. W.	N. W.	Brisk and cloudy.
24	No obs.	No obs.	29.8	67	67	N. N. W.	N. N. W.	N. N. W.	Commences moderate; increasing wind.
25	35 44	17 55	39.9	67	67	W.	S.	S.	Unsteady and baffling.
26	36 40	19 46	30.0	65	68	S. E.	S. S. E.	S. E.	Moderate.
27	37 48	19 48		64	68	Variable	Variable	Variable	Variable; light and calm; heavy swell from eastward.
28	38 14	23 55	29.7	64	68	S. W.	S. W.	S. W.	Brisk.
29	37 18	27 49	29.9	66	66	W. S. W.	S.	S. S. E.	Brisk with heavy squalls.
30	37 02	28 01	30.0	66	66	S. S. E.	S. S. E.	S. S. E.	Brisk with heavy squalls.
July 1	38 20	32 00	30.0	65	66	S.	S.	S.	Moderate; fine weather.
2	38 31	34 50	30.0	66	66	S. W.	S. W.	S.	Moderate; fine weather.
3	38 38	36 27	29.9	67	66	S. W.	N. W.	W. N. W.	Light and baffling.
4	38 26	41 28	30.0	65	65	N. W.	N. W.	N. E.	Brisk and cloudy.
5	38 50	45 54	30.0	61	60	N. N. W.	N.	N. W.	Brisk and cloudy.
6	38 49	49 02	30.0	60	60	N. N. W.	N. N. W.	N. N. W.	Brisk and cloudy.
7	38 18	51 58	30.0	60	60	N. N. W.	N. W.	N.	Brisk and clear.
8	No obs.	No obs.	30.0	65	64	N. N. W.	N. W.	N. W.	Moderate with rain.
9	37 56	60 38	30.0	65	65	N. W.	N. N. W.	N. N. W.	Brisk and clear.
10	No obs.	No obs.	29.8	65	65	N. W.	W.	W.	Squally with rain.
11	38 38	68 38	29.8	65	64	W.	W. by N.	W. by N.	Squally with rain.
12	39 09	71 56	30.0	66	66	W. N. W.	N. W.	N. W.	Fine breeze and cloudy.
13	39 41	No obs.	30.0	66	66	N. W.	W.	S. W.	Squally with thunder and lightning.
14	39 41	80 00	30.0	67	66	W. S. W.	W.	S. W.	Very brisk; clear.
15	39 57	85 21	29.8	66	66	W.	W.	W.	Very brisk; occasional rain.
16	40 08	89 59	29.5	66	66	N. W.	W.	N. W.	Unsteady, blowing hard at times.
17	39 08	94 37	29.6	66	66	W.	W.	W.	Brisk and cloudy.
18	38 57	98 14	30.0	66	66	W.	N. W.	N .W.	Fine breeze and clear.
19	No obs.	No obs.	30.0	65	66	N. N. W.	N.	N. W.	Fine breeze and cloudy.
20	39 12	107 07	30.2	64	66	N. N. E.	N. N. E.	N. N. E.	Fine breeze and clear.
21	39 03	111 02	30.2	67	66	N. N. E.	N.	N.	Fine breeze and clear.
22	38 18	115 20	30.0	66	66	N.	N. W.	N.	Fine breeze; drizzling rain.
23	37 22	119 17	29.9	66	66	N. W.	W. N. W.	W. N. W.	Fine breeze; drizzling rain.
24	36 16	123 30	29.9	68	67	W. S. W.	W. S. W.	W. S. W.	Pleasant breeze.
25	36 04	126 42	30.0	67	67	S. S. W.	S. W.	W. S. W.	Pleasant fine weather.
26	36 00	131 02	30.0	67	67	S. W.	W. S. W.	S. W.	Pleasant fine weather.
27	35 31	133 25	30.1	68	67	W. S. W.	S. W.	W. S. W.	Pleasant fine weather.
28	25 35	134 25	30.0	68	67	W. S. W.	S.	W. S. W.	Moderate, with rain.
29	No obs.	135 14	30.0	68	65	S. E.	E. S. E.	S. E.	Light airs, with rain.
30	No obs.	No obs.	30.0	68	64	N. E.	N.	E. N. E.	
31	No obs.	No obs.	30.0	68	64	N. E.	N. E.	N. E.	
Aug. 1	No obs.	No obs.				N. E.	N. E.	N. E.	Arrived at Port Adelaide.

Captain Ariaans tried this route again at the same season of the year in 1850. With experience now to guide him, he ventured farther to the south, and though he only went about two degrees and a half farther south, he gained by it nearly a week.

From the time when he lost the S. E. trades, June 24, lat. 24° S., to Adelaide, she had 47 days; thus gaining, by edging away only two or three degrees south of the admiralty route, five days. By this deviation he shortened his route and gained better winds, and this is another illustration of the correctness of the remark (p. 745 line 31) suggested by the tables, *i. e.*, you shorten the passage about three days on the average, for every degree you go south of the admiralty route, till you reach the parallel of 46° south.

Abstract Log of the Ship Fly-Away (M. SEWALL). *From off St. Roque to Melbourne, Australia*, 1853.

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Bar.	THERMOMETER 9 A. M.			WINDS.		
					Air.	WATER. Surface.	WATER. Depth.	First part.	Middle part.	Latter part.
Sept. 25	8°00′S.	30°16′W.		29.7	80°	80.3°	80.3	E. S. E.	E. S. E.	E. S. E.
26	10 13	29 30		29.6	80.3	80.3	80.3	E. S. E.	E. S. E.	E. S. E.
27	12 55	27 20	¾ of a mile S. E.	29.7	79	79	79	E. S. E.	E. S. E.	E. S. E.
28	13 59	26 15		29.8	79	79	78.3	N. E.	S. W.	N. E.
29	15 17	25 03	½ k. E.	29.8	79	78	78	N. E.	N. E.	N. E.
30	16 37	25 06	½ k. E.	29.9	77	76	76.3	N. E.	N. E.	E. N. E.
Oct. 1	19 13	22 59	½ k. E.	29.9	75	74.3	74.3	E. S. E.	E. S. E.	E. N. E.
2	20 01	21 08		30.0	73	72	72	E. N. E.	E. N. E.	N. E.
3	23 29	20 36		30.0	72	70	70	E.	E.	E. S. E.
4	27 36	20 24		30.0	71	66.3	68	S. E. by E.	E. S. E.	E. S. E.
5	30 15	20 36		30.1	67	66	67	S. E. by E.	S. E. by E.	S. E. by E.
6	32 00	19 32		30.1	68	64	67	E. S. E.	E. S. E.	E. N. E.
7	34 31	14 45		29.9	64	61	62	N. N. E.	N.	N.
8	38 03	10 19		29.0	64	61	62	N.	N.	N.
9	39 05	5 17		29.4	58	55		W. N. W.	W. N. W.	W.
10	36 35	0 52 E.		29.0	54	53	55	W. S. W.	W. S. W.	S. W. by W.
11	37 22	6 20		29.3	54	53	55	S. W.	S. W.	S. W.
12	38 04	12 00		29.3	55	53	55	W. S. W.	W. S. W.	W. S. W.
13	37 38	17 38		29.5	55	59		S. W.	S. W.	S. W.
14	36 38	21 00		30.3	56	60	60.3	S.	S.	S. S. E.
15	36 06	22 40		30.1	59	64	65	S. S. E.	S. S. E.	S. E.
16	39 54	23 50		30.0	58	60	60.3	E. S. E.	E. S. E.	S. E. by E.
17	43 06	27 58		29.6	54	52	53	N. E. by E.	N. E. by E.	N. E. by E.
18	43 57	33 52		29.0	52	47	47	N. N. E.	N. N. E.	Northerly
19	43 12	39 16		29.4	45	44	45	N.	N. N. W.	W. S. W.
20	42 39	46 44		29.9	41	41	41.3	W. S. W.	S. W.	S. W. by S.
21	42 46	50 51		29.9	41.3	41	40.3	S. S. W.	S.	N. N. E.
22	43 46	56 07		28.8	49	44	45	N. N. W.	W. N. W.	W.
23	42 52	62 17		29.1	46	54	54.3	W.	W.	W.
24	42 45	68 00		29.8	47	51.3	51.3	S. W.	S. W.	W. S. W.
25	42 45	74 02		29.4	53	53.3	53.3	W.	W.	W.
26	42 45	79 56		29.2	53	51.3	51.3	W. N. W.	N. W.	N. W.
27	42 21	82 40		29.4	55	52	52.3	W.	S. W.	N. W.
28	42 30	90 00		29.1	56	51	51.3	W. N. W.	N. W.	W. N. W.
29	42 39	96 26		29.4	53.3	52.3	53	N. W.	N. W.	S. W.
30	42 45	100 07		29.4	49	50.3	51	W.	S. W.	W. N. W.
31	43 01	105 40		29.5	54	51.3	52	W. N. W.	W. N. W.	W. N. W.
Nov. 1	42 51	112 07		29.4	51.3	50	50	N. N. W.	N. N. W.	N. N. W.
2	41 52	117 58		29.0	52	52	52.3	N. N. W.	N. N. W.	S. W.
3	40 40	123 26		29.2	50	51	51.3	S.	S.	S.
4	38 33	125 44		29.2	53.3	53	53.3	S. S. E.	S. E.	E. S. E.
5	39 00	129 04		29.4	53	53	53	S. E.	S. S. E.	S. W.
6	38 48	133 15		29.9	53	53.3	54	S. W.	S. W.	W. by S.
7	38 59	135 48		29.9	54	55	55.3	S. W.	S. W.	N. W.
8	39 00	137 55	½	29.9	54	56	56	W.	W.	W.
9	39 09	141 32	¾, N. E.	29.8	54	56	56	W.	W.	S. W.
10				29.9	53	55	55	S.	S. S. W.	

Sept. 25. Continues light winds and very fine weather; a large swell coming from the south.

Sept. 26. Moderate winds and fine weather; a large swell still coming from the south.

Sept. 27. Begins with a fine breeze and ends with a very light breeze from the northeast; dark heavy appearances in the south; also a heavy swell coming from same quarter.

Found a current setting to the south and east ⅜ of a mile per hour by lunar and chronometer.

Sept. 28. Begins fine; wind northeast and light; through the night wind southwest and squally with rain; ends fine, wind northeast. Saw several vessels steering northward.

Sept. 29. Commences and ends with light northeasterly airs and fine weather; saw a vessel steering north and westward by the wind; have had no southeast trade-winds yet.

Sept. 30. Very light airs, weather fine; ends with passing clouds; dark heavy appearances in the southeast.

Oct. 1. Commences light winds and cloudy; ends fresh breezes and squally; a large sea from the south.

Oct. 2. Strong winds and squally with rain; a very large sea coming from southward; at 11.30 carried away mizzen yard, took in topgallant sails &c.; wind suddenly veered to the southwest at the time.

Oct. 3. Strong winds and squally with rain; took in topgallant sails, fished and sent up crossjack yard; still continues a heavy sea from southward.

Oct. 4. Commences with fresh breezes and squally; ends moderate winds and fine weather with a smooth sea.

Oct. 5. Moderate winds and pleasant weather all these 24 hours; saw a ship steering southward by the wind.

Oct. 6. Commences with light winds from E. S. E. and pleasant weather; ends fresh breezes from E. N. E. and fine. Exchange signals with an English barque steering southward by the wind. *Sea very smooth.*

Oct. 7. Strong winds and pleasant weather throughout the 24 hours; saw quantities of birds.

Oct. 8. Strong gales and dark rainy weather with a rough sea; double-reefed topsails, furled mainsail, spanker, jib, &c. At meridian, wind veered to westward; strong gales and rainy weather. Passed a ship lying to under a close-reefed main-topsail.

Oct. 9. Fresh winds and squally; sea more smooth; out all reefs and set all sail. Saw quantities of *kelp and birds.*

Oct. 10. Strong gales and squally weather, at times rain and hail; were obliged to run off our course on account of heavy squalls from southwest; sea quite smooth.

Oct. 11. Commences strong gales and squally, accompanied with hail and rain; ends moderate and fine weather; a heavy swell coming from southwest.

Oct. 12. Commences moderate winds and light squalls of rain, all sails set; at 6 P. M. commenced breezing and squally appearances, took in studding-sails and all light sails; wind increasing, took in topgallant sails. Wind blowing very heavy accompanied with heavy squalls of rain and hail; a very heavy cross sea running, shipping much water on deck. At 10.30 A. M. triced up the mainsail, wind still

increasing, also the sea; ship laboring heavily and shipping much water on deck. At 10.30 A. M. shipped a large sea to leeward, filling the main deck full of water and taking overboard *two men*, together with other things; ship at the time running before the wind under double-reefed mizzen-topsail, whole fore and mainsails, at the rate of 14 knots per hour; ends hard gales and violent squalls from the southwest.

Oct. 13. Still continues heavy gales and squally with rain; at midnight, more moderate, sea going down; at 6 A. M. wind veered to southward, braced up by the wind, strong breezes and squally with rain. At 8 A. M. double-reefed topsails, set reefed mainsail, jib, &c. At meridian, hard gales and squally.

Oct. 14. Commences strong gales and squally, ends fresh gales and passing clouds; out all reefs and set topgallant-sail. At 10 A. M. water discolored, suppose we are on Lagullas Bank; saw two ships this day from topsail yards.

Oct. 15. Moderate winds and passing clouds; at 8 saw the land; tacked ship to southward; wind southeast; saw several vessels bound westward; ends fresh breezes and cloudy.

Oct. 16. Fresh breezes and cloudy, a heavy sea coming from southeast all this day; no observation this day, sun obscured.

Oct. 17. Fine breezes and cloudy weather; first part of this day, a rough head sea; latter part, smooth.

Oct. 18. Fine breezes and dark foggy weather most of this day; sea smooth, no obscuration.

Oct. 19. Commences moderate and thick foggy rainy weather; ends fresh winds and cloudy. A rough sea making from the southwest.

Oct. 20. Commences strong winds and squally with a rough sea; ends moderate and passing clouds; sea more regular.

Oct. 21. Begins moderate winds and passing clouds with a heavy sea from S. W.; ends with N. N. E. winds and cloudy; sea still coming from S. W.

Oct. 22. Commences fresh gales and squally with much rain; took in all light sails. At 8 P. M. wind increasing, double-reefed topsails, reefed main course; and at 7.30 A. M. took in spanker, furled main course. At 9 A. M. wind increasing, reefed fore course, took in mizzen-topsail, split jib; sea very large and irregular; saw patches of rock-weed and kelp, Crozet's Islands bearing southwesterly about 180 miles distant.

Oct. 23. Begins and ends with strong gales and squally; let reefs out of main-topsail, set topgallant sail, mizzen-topsail; sea very large and irregular: noticed quite a change in the water this A. M.

Oct. 24. Commences fresh gales and squally; during night moderating; ends fine; sea smooth, wind veering to westward.

Oct. 25. Comes in with moderate winds and cloudy; midnight, fine breezes and cloudy; ends fresh gales and dark cloudy weather; a heavy swell from westward.

Oct. 26. Fresh breezes and thick, foggy, rainy weather; saw quantities of rock-weed and kelp; no observation at meridian.

Oct. 27. Commences moderate winds and thick foggy weather; through the night quite moderate; ends fine winds and cloudy; saw patches of rock-weed.

Oct. 28. Begins and ends with strong winds and a rough sea; at times misty damp weather; a part of the time, all possible sail set.

Oct. 29. Commences with strong gales and thick rainy weather; midnight, wind hauled to the southwest; ends southwest winds and cloudy; moderate.

Oct. 30. Begins and ends with moderate winds and dark cloudy weather; nothing worthy of note occurred this day.

Oct. 31. Throughout the 24 hours moderate winds and cloudy weather; a very heavy swell coming from the southwest.

Nov. 1. Commences and ends with N. N. westerly winds and cloudy weather; sea quite smooth.

Nov. 2. Commences with winds from N. N. W. and cloudy; at 10 A. M. wind hauled suddenly into the southwest; ends strong gales and squally.

Nov. 3. Strong gales and squally with rain; ends strong gales and passing clouds; under double reefs.

Nov. 4. Begins with fresh gales and dark cloudy weather; ends more moderate; dark rainy weather; ship under double reefs.

Nov. 5. Moderate winds from S. E. with dark heavy appearances; through the night, wind veering to the south; ends strong southwesterly gales and dark rainy weather; passed a ship steering same course; weather threatening.

Nov. 6. Moderate and pleasant with a heavy S. W. swell; found a northerly current this day of ½ knot per hour, the first we have experienced since we have been on the coast of Australia.

Nov. 7. Moderate and very fine weather; at meridian, wind hauling to the westward; a heavy southwesterly swell; this day we have steered E. by S. by compass 120 miles distance, and have made only 11 miles difference of latitude. I find by two good observations this morning by chronometer, that we have had a northeasterly current of one mile per hour, setting us in towards the Great Australian Bight; 79 days out.

Nov. 8. Very moderate and fine throughout the day; a heavy southwesterly swell from a northeasterly current.

Nov. 9. Moderate winds and fine weather; a heavy southwesterly swell; ends moderate and cloudy, wind being to southward.

Nov. 10. Comes in with cloudy rainy weather; at midnight, dark and rainy; sounded in 58 fathoms water. At 12.30 saw Cape Otway light bearing N. E., distance 12 miles. At 8 A. M. off entrance of Port Philip; at 10 came to anchor in Hobson's Bay, 80 days from New York. If we had been favored with a moderate share of favorable winds through the trades or tropics, we probably might have made a somewhat quicker passage. Winds and weather during the whole passage have been very unsettled and changeable. After having crossed the southeast trade-winds, I endeavored to get as far south as 50° and 55° and in that parallel run down my easting; but owing to strong southerly and southwesterly gales was prevented from doing so.

Abstract Log of the Barque Oriental (J. J. HEARD). *From off St. Roque to Melbourne, Australia*, 1853.

Date.		Latitude at noon.	Longitude at noon.	Bar.	Ther. 9 A. M. Air.	Ther. 9 A. M. Water.	Winds. First part.	Winds. Middle part.	Winds. Latter part.
Oct.	13	9° 23′ S.	26° 15′ W.	29.95	80°	78°	S. E.	E. S. E.	E. S. E.
	14	11 19	27 40	29.95	80	78	S. E.	S. S. E.	S. S. E.
	15	13 22	28 43	30.00	78	78	S. S. E.	S. E.	E. S. E.
	16	14 52	29 30	30.00	76	78	S. S. E.	S. E.	E. by S.
	17	16 05	29 44	30.00	78	78	S. E.	S. E.	E. by S.
	18	17 42	29 25	30.00	80	78	East	E. N. E.	E. N. E.
	19	19 38	29 06	30.00	78	74	E. N. E.	N. E.	N. E.
	20	22 06	28 33	29.95	76	74	N. E.	N. by E.	N. by E.
	21	24 11	28 21	29.95	72	72	North	N. W.	W. N. W.
	22	26 21	27 35	29.95	72	72	N. W.	W. by N.	W. by N.
	23	28 07	27 18	29.95	68	68	W. by N.	W. by N.	W. by S.
	24	28 37	27 24	30.00	70	67	W. by S.	Calm	North
	25	31 02	No obs.	29.50	66	66	North	N. E.	N. W. to W.
	26	32 52	26 06	29.70	68	63	West	N. W.	N. W. to W.
	27	35 07	24 37	29.70	62	60	W. N. W. to N.	W. N. W. to N.	W. N. W. to N.
	28	37 07	23 12	29.50	56	58	N. W. to N.	N. W. to N.	N. to W.
	29	38 04	20 01	29.85	54	56	West	S. W.	S. W.
	30	38 36	17 03	30.10	54	55	West	W. to	W. N. W.
	31	40 21	14 08	29.70	54	55	W. N. W.	W. N. W.	N. N. W.
Nov.	1	41 51	11 20	29.60	50	50	N. N. W.	W. N. W.	W. N. W.
	2	42 35	9 31	30.05	48	45	N. W.	N. W.	N. to N. E.
	3	43 36	6 48	30.00	54	50	N. W.	N. W.	N. W.
	4	44 41	3 51	29.90	50	42	N. W.	N. W.	N. W.
	5	46 06 D. R.	1 44 D. R.	29.30	46	41	N. W.	N. N. E.	N. W.
	6	46 46 D. R.	1 03 E. D. R.	29.80	38	39	N. W.	South	E. N. E.
	7	47 51 D. R.	4 02 D. R.	29.40	44	40	E. N. E.	E. N. E.	N. W.
	8	49 23 D. R.	7 52	29.20	40	35	N. W.	N. W.	N. N. W.
	9	50 13 obs.	11 21 chro.	29.60	34	33	N. W.	W. N. W.	West
	10	51 05 D. R.	14 57	29.60	37	33	West	W. and N. W.	North
	11	52 26 D. R.	19 42	29.10	34	31	N. N. E.	N. W.	N. W.
	12	52 16 D. R.	22 43	29.10	31	31	N. W.	West	S. S. W.
	13	52 20 D. R.	27 47 D. R.	29.20	32	34	West	W. N. W.	W. N. W.
	14	51 03 D. R.	32 21 D. R.	29.60	32	32	W. N. W.	W. N. W.	West
	15	51 20 D. R.	37 06 D. R.	29.20	35	34	W. to N. W.	W. to N. W.	W. to N. W.
	16	51 15 D. R.	41 40 D. R.	29.00	34	33	N. W.	N. W.	N. W.
	17	50 09 D. R.	45 53 D. R.	29.60	34	33	N. W.	N. W.	West
	18	51 02 D. R.	49 23 D. R.	29.60	38	36	N. W.	N. W.	N. W.
	19	51 57 D. R.	52 17 D. R.	29.50	37	34	N. W.	N. N. W.	N. E.
	20	53 17 D. R.	56 03 D. R.	28.95	35	33	N. E.	North	N. N. E.
	21	53 41 D. R.	58 07 obs.	29.30	37	34	N. E.	Calm	S. W.
	22	53 45 D. R.	61 32 D. R.	29.20	34	34	West	N. W.	N. E.
	23	53 22 obs.	66 22 obs.	29.20	37	34	N. E.	N. W.	W. N. W.
	24	53 29	70 38 obs.	29.10	34	34	W. N. W.	N. W.	N. E.
	25	53 26	74 19	29.05	37	34	N. E.	N. W.	N. W.
	26	53 26 D. R.	78 32 D. R.	28.90	34	33	N. W.	N. W.	N. E.
	27	53 46 D. R.	83 55 D. R.	28.45	34	32	N. E.	N. E.	North
	28	53 51 obs.	86 40 obs.	28.70	34	33	North	North	North
	29	53 21	92 17	28.95	36	35	North	N. W.	N. E.
	30	54 23 D. R.	92 38 D. R.	28.70	36	35	N. E.	E. N. E.	East
Dec.	1	54 09	92 57	28.65	36	35	E. N. E.	S. E.	S. S. E.

Abstract Log of the Barque Oriental—Continued.

Date.	Latitude at noon.	Longitude at noon.	Bar.	Ther. 9 A. M.		Winds.		
				Air.	Water.	First part.	Middle part.	Latter part.
Dec. 2	52° 57′ S.	95° 20′ E.	28.70	35	35	S. S. E.	S. to	S. W.
3	51 20 obs.	98 13 obs.	29.10	35	35	S. W.	S. W. to	W. S. W.
4	50 17 D. R.	99 09 D. R.	28.60	38	38	W. S. W.	Calm	East
5	49 13 obs.	104 12 D. R.	28.70	44	42	N. N. W.	to	N. W.
6	48 18	107 47 obs.	29.35	48	44	N. W.	N. N. W.	N. N. W.
7	47 52 D. R.	109 34 D. R.	29.60	46	46	N. N. W.	North	E. N. E.
8	47 31 D. R.	114 02 D. R.	29.70	50	48	North	N. N. W.	N. N. W.
9	48 12 D. R.	117 43 D. R.	29.15	50	48	N. N. E.	N. N. E.	N. N. E.
10	47 42 obs.	121 13 obs.	29.00	49	48	N. N. E.	N. by W.	N. by W. to N. W. by N.
11	46 37	124 53	29.50			N. W. by N.	N. W. by N.	N. W. by N.
12	45 28	127 46	29.50	53	51	N. by W.	N. N. W.	N. by W.
13	44 07	131 18	29.40	54	52	N. N. W.	W. N. W.	W. S. W. to S. W.
14	42 41	134 16	29.80	56	52	W. S. W.	W. S. W.	W. S. W.
15	41 30 D. R.	136 47 D. R.	29.90	55	54	W. S. W.	West	N. W.
16	39 33 obs.	139 43 obs.	29.85	62	60	N. W.	to	S. W.
17	38 44	142 32	29.90	56	56	S. S. W.	South	S. E.
18	38 40	142 13	29.85	59	61	S. E. to	E. to	S. E.
19	39 11	142 29	29.60	64	60	S. E. to	E. and	E. N. E.
20	38 52	142 38	29.70	68	60	Calm	Calm	Calm
21	39 17	143 47	29.65	62	62	East	S. E. to E.	E. to E. N. E.
22			29.60	68	64	East	E. N. E.	Calm and W. S. W.

Oct. 13. Fresh breezes; pleasant weather; head sea. Saw a sail in the distance bound N. W. Current, $\frac{2}{3}$, E. by S.

Oct. 14. Pleasant weather; fine breezes; head sea. No current.

Oct. 15. Pleasant breezes; head sea. Current, 1 knot, S. E. $\frac{1}{2}$ E.

Oct. 16. Pleasant breezes; very little head sea. Saw a whale. No current.

Oct. 17. Very light airs and pleasant. Saw two barques, one to the eastward, the other to the westward, bound northward.

Oct. 18. Pleasant breezes. First and middle parts, light rain squalls. Latter part, pleasant; larboard studding-sails set. Two barques in company, one English, the other too distant.

Oct. 19. Pleasant breezes; fine weather.

Oct 20. Fresh breezes. At 3 P. M. made the island of Trinidad; at 4.30, made Martin Vas; at 10 P. M. Martin Vas, N. E. by E., distant 8 miles. Passed between the islands. At 7 P. M. Trinidad bearing S. W. by W.; light swell of the sea after us. Current, $\frac{3}{4}$ knot, N. E. $\frac{1}{2}$ E.

Oct. 21. Fresh breezes and passing rain squalls; light swell from the westward. Current, 1 knot, N. N. E.

Oct. 22. Fresh breezes; very heavy swell from westward. Thus I allow one knot per hour to the eastward for heave of the sea. Have seen several birds called fish-hawks. Current, 1 knot, N. E. $\frac{1}{4}$ E.

Oct. 23. Pleasant weather; light swells from westward. Saw a cape pigeon; first seen.

Oct. 24. Light airs and calms. First part, weather clear; middle and latter part, hazy. Current, ¼ knot, S. W. ½ S.

Oct. 25. From midnight to 2 A.M., the barometer fell from 30.00 to 29.50, and heavy squalls, attended with rain from N. E., which brought us down to double-reefed topsails; mainsail, outer jib, and spanker stowed. From 8 A. M. to noon, the wind veering by north to west; first time we have been obliged to take in the main-topgallant-sail and to reef topsails. 74 days from Boston.

Oct. 26. Fresh breezes and passing squalls; swell from N. W. Took in and made sail as required.

Oct. 27. Fresh breezes with westerly swell. At 4.30 A. M. passed over colored water, dark green; an hour and a half going over; I should judge, from the color of it, not more than 60 fathoms deep, with a heavy ground swell; weather pleasant.

Oct. 28. At 7 P. M., heavy thunder squall from W. to N. W., attended with lightning, rain, and hail; took in all light sails and reefed topsails; strong breezes and heavy sea from W. to N. W., attended with squalls, and so ends.

Oct. 29. Strong breezes, attended with squalls and heavy sea running. Many birds about.

Oct. 30. First part, strong breezes; middle and latter parts, light. Saw two grampuses.

Oct. 31. Strong breezes and pleasant weather; heavy sea on. Saw two whales.

Nov. 1. Strong breezes and heavy sea. Middle part, rainy; latter part, cloudy.

Nov. 2. Fresh breezes. Middle and latter part, light airs; weather cloudy. Heavy swell.

Nov. 3. Light airs and pleasant weather; heavy swell from west. Saw flocks of penguins going north.

Nov. 4. Pleasant breezes; fog set in at midnight with occasional breaks; observations quite indifferent. From the great change in the weather, I should judge there were icebergs not far from us; there is also a great chilliness in the atmosphere, and has been for several days. There is a great number of whale birds about to day, a few cape pigeons; the larger birds all disappeared.

Nov. 5. First and middle part, light airs and foggy; latter part, strong breezes and heavy sea running. Took in light sails and double-reefed topsails.

Nov. 6. First part, strong breezes and tremendous sea; midnight, moderated. Let out reefs and made sail; cloudy weather; no observation; very chilly.

Nov. 7. First and middle part, fresh breezes with fog and drizzling rain; latter part, cloudy.

Nov. 8. Fresh breezes all these 24 hours. First part, dense fog; middle part, clear; latter part, thick fog. I cannot account for the fog here unless there be ice near us.

Nov. 9. Strong breezes and heavy sea. First and middle part, foggy; latter part, passing snow squalls.

Nov. 10. Strong breezes. First and middle part, clear; latter part, cloudy. Ice made on deck last night.

Nov. 11. Heavy breezes, attended with heavy sea. Latter part, more moderate with frequent snow squalls. At 5 A. M. saw an iceberg north of us; I should think it was ¼ of a mile in length, and about 60

feet above the water. There are many birds about, both large and small. Last night, and the night before, a cape pigeon alighted on the deck.

Nov. 12. Fresh breezes. Middle and latter part, moderate; wind veering from N. W. to S., and back to S. W.; 6 A. M. snow storm till 8 A. M. Barometer, 28.90. Ends with light flurry of snow. Large number of birds about, cape pigeons, whale birds, and goneys.

Nov. 13. Commences with strong breezes; middle and latter part, blowing a gale, with frequent snow squalls and a very heavy sea running. From 5 to 6.30 P. M. saw three icebergs, two at the south and one north of us. Several patches of kelp have been seen during the past week. This day ends with tremendous sea and strong gales. At midnight, barometer, 28.90.

Nov. 14. Commences with a gale from W. to W. N. W., very heavy sea; middle and latter part, more moderate, wind and sea going down. Passed four icebergs. Snow squalls and cloudy. Imperfect observations.

Nov. 15. Strong breezes and uncertain weather, with snow, hail, and rain squalls; winds baffling from W. to W. to W. N. W., and N. W.; ends same with barometer falling. At 3 P. M. saw an iceberg north of us. I should not recommend any one's coming down here this month; for, when it snows, one can see but a very short distance, and icebergs are too plenty to run with safety.

Nov. 16. All these 24 hours a gale from N. W.; very heavy sea running. Barometer, through the night, 28.90. Weather hazy; sun broke through the clouds a very few moments this morning. Observations very indifferent. Ends with snow squalls and tremendous sea.

Nov. 17. First and middle parts, gale, attended with heavy sea; latter part, more moderate.

Nov. 18. Fresh breezes. Latter part, more moderate. Very dense fog.

Nov. 19. Moderate breezes and thick fog. No observation. Barometer falling. Saw four whales.

Nov. 20. Variable breezes and squally. Large number of whale birds about.

Nov. 21. First part, fresh breezes and snow storm; middle, calm; latter part, light breezes.

Nov. 22. First part, light breezes and snow squalls, with an occasional break in the clouds. At 7 A.M. thick fog; wind hauled from N. W. to N. E.; ends with snow storm. Barometer falling.

Nov. 23. Strong breezes and snow squalls. During middle part, barometer fell to 29.00. Yesterday saw sperm whales.

Nov. 24. Fresh breezes and snow squalls. Tide rip setting N. E. Barometer falling.

Nov. 25. Pleasant breezes and passing snow squalls; latter part, clear. The first clear weather we have had for 20 days. At 8.30 A. M. made land; at first took it for icebergs, as no island is laid down on my chart, nor in the epitome. At 11 A. M., the clouds cleared away, showing it to be an island; at noon, the eastern end bore, per compass, N. N. E. 20 miles; the western end bore, per compass, N. by W. about 20 miles. I make the west end of the island 74° 15′ E. long.; east end 74° 40′; lat. 53° 10′. Near the centre of the island a high peak, 5,000 feet high. Large number of birds.

Nov. 26. Fresh breezes and passing snow squalls. Latter part, cloudy and misty.

Nov. 27. Fresh breezes and thick weather. At 9 P. M. barometer commenced falling; and at 8 A. M.

stood at 28.40. Took in all light sails and close-reefed topsails. I do not understand the low state of the barometer, with the appearance of the weather, which looks like a whole topsail breeze.

Nov. 28. Commences with thick foggy weather, with passing snow squalls; latter part, pleasant. At 10 A. M. hail squall. The barometer has not got above 28.70, though the weather looks fine. At 4 A. M. let reefs out; at 3.30 and at 5 P. M. passed icebergs, one north and the other south of us; latter part of the night and early part of the morning, passed over colored water, I should judge about 150 fathoms deep. At 3 P. M. saw seven right whales. Unusual number of whale birds about to-day.

Nov. 29. Fresh breezes and light snow squalls.

Nov. 30. Commences with strong breezes. At 4 P. M. commencing to blow in gusts; took in light sails. At 5.30 double-reefed topsails. At 11 P. M. gale increasing. Barometer, 28.50; close-reefed topsails and stowed foresail. At 8 A. M. calm. Barometer, 28.60. At 10 A. M. light air from east; made all sail by the wind; ends cloudy. No observation. Tacked ship to the north.

Dec. 1. Moderate breezes, attended with snow squalls. At 6 P. M. tacked ship to south; at 4 A. M. tacked to the north and east; cross seas on; ship laboring much.

Dec. 2. Moderate breezes and thick fog most of the time, with snow squalls; wind veering from S. S. E. to S. W. and back to S. S. E. Saw a large iceberg south of us. From 7 A. M. to meridian passed over colored water.

Dec. 3. First and middle parts, fresh breezes and snow squalls; latter part, stiff breezes and clear. Between midnight and 1 A. M. the Aurora Australis made a very brilliant appearance from S. to S. W., shooting up with a white light, illuminating the whole heavens, and making everything about deck perfectly distinct.

Dec. 4. First part, light breezes; middle, calm; latter part, fresh breezes. At 11 A. M. wind hauled suddenly from E. to N. N. W.; ends stiff breezes. It is the second time the wind has hauled with the sun, since we have been S. of 30°. This morning saw a very large sperm whale; an ugly cross sea on and swell from W. From meridian to 6 P. M. passed over colored water.

Dec. 5. Commences with strong breezes. At midnight increasing, took in light sails; at 7 A. M. wind increasing, coming in heavy squalls and gusts with rain. Fore-topgallant sail and flying-jib split. At midnight, stowed main-topgallant sail, spanker, and mainsail, and double-reefed the topsails; inner jib split in pieces; ends with a heavy gale from N. W., and tremendous sea on. During the past 24 hours passed over several patches of kelp. The Aurora Australis was again seen between midnight and 1 A. M.; had the same appearance as on the previous night, but only seen in the W. and S. W.

Dec. 6. All these 24 hours strong breezes. First and latter parts, pleasant; middle part, thick drizzling rain. Heavy sea running. Cape pigeons have left us.

Dec. 7. First part, fresh breezes; middle and latter parts, very light airs with drizzling rain.

Dec. 8. All these 24 hours fresh breezes. First part, weather pleasant; middle and latter parts, cloudy. Passed several small patches of kelp.

Dec. 9. Fresh breezes and cloudy. From 8 P. M. to midnight, took in light sails and topgallant-sails.

At 7 A.M. wind increasing, coming in gusts with drizzling rain. Double-reefed the topsails and reefed the mainsail; cross sea on; ends with drizzling rain. Passed kelp. Nearly all the birds have left us.

Dec. 10. Commences with strong breeze and heavy sea on. At 6 P. M. moderating; let one reef out of each topsail; set inner jib, main-topsail, staysail, and main-topgallant sail. At 4 A. M. wind increasing; took in main-topgallant sail, maintopmast staysail, and inner jib. At 7.30 wind increased to a gale; double-reefed the topsails; wind then hauled from N. by W. to N. W. by N; heavy head sea on and ship laboring hard; ends with a gale and clear weather. Saw detached pieces of kelp.

Dec. 11. First and middle parts, strong breezes. At 4.30 A.M. moderating; let reefs out and set light sails; ends pleasant weather.

Dec. 12. All these 24 hours pleasant breezes and pleasant weather.

Dec. 13. Commences with fresh breezes, gradually increasing through the night; and at 7 A. M. brought down to double-reefed topsails; ends strong breezes and passing clouds. Saw two large sperm whales. Heavy sea on.

Dec. 14. Fresh breezes and pleasant weather. At 6 P. M. saw sperm whale.

Dec. 15. First and middle parts, pleasant; latter, fresh breezes and cloudy.

Dec. 16. Pleasant weather and fine breezes. Two sail in company.

Dec. 17. Pleasant weather and fine breezes.

Dec. 18. Pleasant weather and fine breezes. At 3.30, tacked to S. and W.; midnight, tacked again to N. and E.; at 4 A. M. to S. and E.; at 7.30 A. M. again tacked to N. Made Bald Head bearing N. N. E., distant about 12 miles.

Dec. 19. Pleasant weather and light breeze. At 3.30 P. M. tacked off the land in Portland Bay; at 8 A. M. tacked to north.

Dec. 20. Light airs and calms all these 24 hours. Land in sight.

Dec. 21. Pleasant breezes; by spells, foggy. At 9 P. M. tacked to the eastward; at 8 A. M. tacked off shore. Cape Otway light, bearing W. by N. per compass, distant 16 miles.

Dec. 22. First part, light airs; middle part, light airs and puffy. At 8.30 A. M. a fresh breeze sprung up from W.; cloudy. No observation.

Dec. 22. Civil account.

At 4 P. M. took pilot off the Heads; at 4.30, took bay pilot; and at 9.30 P. M. anchored in Hobson's Bay.

Abstract Log of the Barque Duchess, of Boston (ERNEST LANE). *From off St. Roque to Australia*, 1853.

Date.	Latitude at noon.	Longitude at noon.	Bar.	THER. 9 A. M.		WINDS.		
				Air.	Water.	First part.	Middle part.	Latter part.
Nov. 9	8° 34′ S.	33° 28′ W.	30.20	82°	81°	S. E.	S. E.	S. E. by E.
10	11 09	32 20	30.02	81	81	S. E. by E.	E. S. E.	E. by S.
11	13 38	33 30	30.22	81	80	E. S. E.	S. E. by E.	E. S. E.
12	15 55	33 12	30.02	80	80	S. E. by E.	E. S. E.	E. S. E.
13	17 44	32 50	30.25	79	78	Calm	E. by S.	E. by N.
14	20 10	32 24	30.28	79	77	E. by N.	East	E. S. E.
15	21 57	32 02	30.32	78	75	Calm	E. N. E.	East
16	24 12	31 45	30.36	75	73	East	E. S. E.	E. S. E.
17	26 42	31 23	30.38	71	73	E. S. E.	E. by S.	E. by S.
18	28 52	30 45	30.25	73	71	East	E. N. E.	N. E. by N.
19	30 34	29 42	30.14	73	69	N. N. E.	N. N. W.	N. by W.
20	32 40	28 40	30.05	66	65	N. N. W.	N. W.	N. W.
21	33 35	28 04	30.01	69	66	N. W.	N. N. W.	N. E.
22	36 00	27 25	29.60	69	63	North	North	North
23	36 19	25 38	29.85	58	59	N. N. W.	N. W.	W. S. W.
24	37 33	23 02	29.85	64	60	W. N. W.	N. W.	N. W.
25	38 26	21 10	30.08	52	58	N. W.	S. W.	S. S. W.
26	38 35	18 50	30.53	52	57	S. S. W.	West	W. N. W.
27	39 39	16 10	30.28	58	55	W. N. W.	N. W.	N. W.
28	41 10	13 29	30.20	58	53	N. W.	N. W.	N. W.
29	42 18	10 29	30.27	55	51	N. W.	N. W.	N. W.
30	42 58	7 30	30.22	66	51	N. W.	N. N. W.	North
Dec. 1	43 26	4 15	29.88	51	47	North	N. N. E.	N. E.
2	43 20	0 00 31″	30.07	51	48	North	N. N. W.	N. W.
3	43 32	2 23 E.	29.75	48	48	N. N. W.	W. N. W.	West
4	43 35	5 26	29.90	53	48	West	W. N. W.	N. W.
5	53 40	8 11	29.85	45	48	N. W.	West	S. W.
6	43 38	11 53	30.11	45	47	S. S. W.	S. W.	S. W.
7	43 26	15 50	30.10	48	47	S. W.	W. S. W.	S. W.
8	43 01	19 18	30.25	46	49	S. S. W.	S. S. W.	S. W.
9	42 09	22 08	30.45	46	55	S. W.	S. S. W.	South
10	42 00	24 32	30.35	52	55	South	South	S. S. W.
11	41 42	26 08	30.35	52	52	South	South	S. by W.
12	41 54	28 42	30.15	60	53	Calm	North	N. W.
13	42 07	31 42	30.10	62	56	W. N. W.	West	W. N. W.
14	42 30	34 40	29.82	62	54	N. W.	North	N. N. E.
15	42 42	38 44	29.50	52	50	N. N. W.	N. N. W.	N. W.
16	42 52	42 02	29.73	53	48	N. W.	N. N. W.	North
17	43 14	46 03	29.60	52	44	N. N. E.	N. N. W.	N. W.
18	43 33	48 50	29.48	47	42	N. N. W.	North	
19	43 11	52 22	30.10	47	43	N. N. W.	W. N. W.	West
20	43 13	56 04	30.10	51	46	W. N. W.	North	N. N. W.
21	43 17	59 32	29.63	58	54	N. N. W.	North	North
22	43 21	64 20	29.60	55	60	North	N. W.	N. W.
23	43 04	67 00	29.80	51	57	N. W.	W. N. W.	W. N. W.
24	42 41	70 19	30.10	52	57	W. by N.	W. N. W.	W. N. W.
25	42 24	73 43	30.10	57	55	W. N. W.	W. N. W.	W. N. W.
26	42 06	77 00	30.00	57	51	West	W. N. W.	W. N. W.
27	42 00	80 30	29.70	51	53	W. N. W.	W. N. W.	W. S. W.
28	42 01	84 25	29.80	56	53	West	W. N. W.	West
29	42 03	87 16	29.82	60	53	W. N. W.	W. N. W.	W. N. W.

Abstract Log of the Barque Duchess, of Boston—Continued.

Date.	Latitude at noon.	Longitude at noon.	Bar.	THER. 9 A. M.		WINDS.		
				Air.	Water.	First part.	Middle part.	Latter part.
Dec. 30	42° 08′ S.	91° 20′ E.	29.60	57°	54°	N. W.	North	N. W.
31	42 02	94 27	30.02	57	53	W. N. W.	West	W. N. W.
1854					54			
Jan. 1	42 02	97 58	29.92	59	51	N. N. W.	N. N. W.	W. N. W.
2	41 32	100 30	30.13	54	56	West	N. W.	North
3	41 44	103 35	30.00	58	54	North	N. W.	W. N. W.
4	41 59	107 12	30.10	57	54	N. N. W.	N. W.	N. W.
5	41 58	109 51	30.15	54	55	W. N. W.	West	West
6	42 05	112 07	30 23	60	55	West	West	N. W.
7	42 00	115 08	30.25	61	56	W. N. W.	West	West
8	42 00	118 17	30.10	64	56	West	N. N. W.	N. N. W.
9	41 45	121 25	29.78	59	57	N. N. W.	N. N. E.	N. N. W.
10	41 45	124 39	29.82	52	56	N. N. W.	S. W.	S. W.
11	41 13	127 44	30.08	57	59	S. W.	S. W.	S. W.
12	40 42	130 52	30.10	57	59	West	N. W.	W. N. W.
13	40 13	134 04	30.05	59	59	N. W.	W. N. W.	West
14	39 56	136 30	29.93	62	61	West	N. N. W.	N. N. W.
15	39 34	139 16	29.93	60	62	N. N. W.	N. N. W.	West
16	39 03	142 34	29.93	61	63	W. N. W.	W. N. W.	W. N. W.
17	38 55	143 14	30.15	61	64	W. N. W.	Calm	N. W.
18			30.10	68				

Nov. 9. Brisk trades and pleasant weather.

Nov. 10. Fresh trades and cloudy weather.

Nov. 11. Fresh trades and magnificent weather.

Nov. 12. Brisk trade-winds; ends fine; all sail set.

Nov. 13. Calm weather, and fine breeze again from E.

Nov. 14. Commences pleasant weather and brisk trades.

Nov. 15. Calm weather; ends pleasant, and brisk breeze.

Nov. 16. Pleasant trades, with long rolling sea from S. W.

Nov. 17. Fresh breezes and passing clouds.

Nov. 18. Fine breezes, and weather clear.

Nov. 19. Fine breezes, and pleasant, smooth sea; ends pleasant and hazy.

Nov. 20. Fresh breezes and hazy; at 4 P. M., thick fog, with fine rain; ends misty and moderate.

Nov. 21. Moderate, and thick fog, with large sea from S. Several cape pigeons and albatrosses about ship; through middle part, moderate and calm, and thick fog; ends moderate and foggy.

Nov. 22. Thick fog and fine rain; through night, fresh breezes and the same.

Nov. 23. Heavy gale from N. W., with a large sea; water very green; ends brisk breeze from W. S. W.

Nov. 24. Brisk breezes with passing fog; water very green; ends dry weather, with passing clouds and strong breeze.

Nov. 25. Cloudy and threatening; hauled in the studding-sails, handed topgallant sails, spanker and mainsail, double-reefed the fore and main-topsails; raining and blowing a gale; large sea running. 9 A. M. heavy squall, with rain; split spanker, unbent it; in mainsail; large sea and cold weather.

Nov. 26. Strong breezes and squally; an ugly sea running; barque laboring heavy. Ends brisk west winds, and cloudy.

Nov. 27. Fresh breezes and cloudy; ends much the same; heavy sea from west, and cloudy.

Nov. 28. Strong N. W. winds, and quite pleasant; large sea from west; vessel rolling very deep and heavy. Through night, fresh breezes; barque rolling very heavy. Ends thick fog and brisk breeze.

Nov. 29. Brisk breeze and foggy weather; through night, strong breeze and misty; ends thick fog, with large, long sea, frequently from S. S. W., making the barque roll heavy.

Nov. 30. Fresh breezes and foggy weather; ends much fog, and lightning.

Dec. 1. Pleasant weather. At 3 A. M. wind hauling to N. E. by E., with rain, and very cold; handed royals, flying jib, gaff-topsails, and staysails. 7 A. M. strong breeze with rain; handed fore-topgallant sail. Ends same, rainy, strong breeze.

Dec. 2. Fresh breezes and fine rain; large sea; ship making considerable water; handed spanker and main-topsail. At 8 P. M. fresh gale and large sea; double-reefed fore and main-topsails, furled jib; running E. S. E., in the trough, rolling and laboring heavily.

Dec. 3. Moderate airs and large sea, with thick fog; ends passing fog and brisk breeze.

Dec. 4. Moderate airs and pleasant weather; at midnight, clear and moderate; latter part, brisk breeze and cloudy.

Dec. 5. Moderate airs and cloudy; through the night, fine rain and moderate winds; ends same, thick rain, and cold weather.

Dec. 6. Pleasant and cloudy; through the night, strong breezes, cloudy and cold; ends same, strong breezes and cloudy, with large sea from S. W.

Dec. 7. Commences fresh breeze from S. W., and cloudy; through the night, strong breezes; ends cloudy, large sea from S. W.

Dec. 8. Fresh winds; at 8 P. M. strong gales and squally, some hail and snow; ends the same.

Dec. 9. Commences fresh breezes, and large sea (water green). At 6 P. M., blowing a heavy gale, with fierce squalls, hail, and snow; furled mainsail and jib. At 10 P. M., blowing heavy, vessel laboring heavy and shipping large quantities of water; kept her off east to ease her. At 4 A. M., moderates; large sea; wind south. Ends the same.

Dec. 10. Commences pleasant, wind south, water very green; through the night, south winds and clear weather; ends cloudy and brisk breeze.

Dec. 11. Moderate and pleasant weather; middle, same, small clouds; ends pleasant and smooth.

Dec. 12. Fine, pleasant, and calm; middle, pleasant; ends same.

Dec. 13. Moderate breeze and cloudy, sea smooth; ends same.

Dec. 14. Moderate breeze; at 8 P. M. hauled to north, brisk breezes; middle, brisk breezes and heavy dew; ends brisk breeze and cloudy.

Dec. 15. Fresh breeze and cloudy, circle round the sun; middle, fine rain, bright circle around the moon; 4 A. M., more moderate, made all plain, drawing sails; ends rain and strong gale.

Dec. 16. Strong gale, large sea; middle, more moderate, rolling very heavily; ends strong breezes and cloudy.

Dec. 17. Fresh gales; middle, heavy gale, and large sea; ends fresh gale, heavy sea, and fog.

Dec. 18. Commences fresh breezes; ends cloudy.

Dec. 19. Strong breeze; ends cloudy.

Dec. 20. Moderate and clear; ends strong breeze and clear.

Dec. 21. Begins with strong breeze, clear weather; ends much rain and wind.

Dec. 22. Strong breeze. Through the night, fresh gales, rainy, and fog; large sea; shipping considerable water. Ends fresh gales, large sea.

Dec. 23. Strong breeze, large sea; middle, squally, with rain and hail; ends strong breezes and passing clouds.

Dec. 24. Strong breeze, with frequent squalls; at 9 P.M., a very heavy squall, with cutting rain and hail; ends very cloudy, with an occasional squall.

Dec. 25. Thick rain and strong breezes.

Dec. 26. Fine, pleasant day, nice breezes, &c.

Dec. 27. Brisk breezes; at midnight, thick rain and ugly sea; ends same.

Dec. 28. Brisk breeze; middle, squally, with rain and hail; latter part, fresh breeze and large sea.

Dec. 29. Fine weather; ends same.

Dec. 30. Fine weather; middle, strong breeze, thick weather; ends strong breeze.

Dec. 31. Pleasant and moderate; ends same.

January 1, 1854. Moderate and pleasant; through the night, thick and rainy; ends fresh breezes.

Jan. 2. Pleasant and moderate; middle, moderate and foggy; N. N. E. current.

Jan. 3. Moderate breeze, and foggy, misty weather; ends moderate and misty.

Jan. 4. Moderate and thick fog, smooth; night clear and pleasant; 6 A. M., thick fog and brisk breeze.

Jan. 5. Moderate and thick fog; middle, clear and pleasant; ends moderate.

Jan. 6. Pleasant; through the night, clear and pleasant.

Jan. 7. Moderate and fine; ends moderate and cloudy.

Jan. 8. Very moderate; latter part, brisk breeze and cloudy.

Jan. 9. Brisk breezes and cloudy; ends foggy.

Jan. 10. Fine rain, and moderate; ends fresh breeze, with frequent hail squalls.

Jan. 11. Fine breezes and puffy; ends fine and passing clouds.

Jan. 12. Fine breeze and cloudy; middle, fresh breezes; ends strong breezes.

Jan. 13. Fine, strong breeze, and cloudy; ends moderate.

Jan. 14. Commences moderate and pleasant; ends squally.

Jan. 15. Fresh breeze; middle, moderate and pleasant; ends pleasant and smooth.

Jan. 16. Commences fine breeze and cloudy; ends pleasant.

Jan. 17. Commences pleasant; ends moderate.

Jan. 18. Commences moderate breezes from west; 2 P. M., made Cape Otway, bearing east 18 miles; 8 P. M., the light bearing N. E. 14 miles; calm all night.

Jan. 19. Pleasant; tacking to windward all night; at 5 P. M. came to anchor off Hobson's Bay. Thus ends a passage of 122 days.

Abstract Log of the Ship Malay (SAM'L HUTCHINSON, JR.). *From off St. Roque to Hobart Town*, 1853.

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Bar.	THER. 9 A. M. Air.	Water.	WINDS. First part.	Middle part.	Latter part.
Nov. 22	6°06′ S.	33°17′ W.	23, S. W. ¼ W.	29.88	82°	79°	S. E. ½ S.	to	S.E. by E. ½ E.
23	8 42	32 57	10, Westerly	29.90	82	80	S. E. by E.	E. S. E.	E. ½ S.
24	11 34	33 12		29.92	81	79½	E. S. E.	S. E.	S. E. by E.
25	14 39	33 31	5, N W. ¾ W.	29.95	79½	79½	S. E.	to	E. S. E.
26	18 08	33 25	13, S. by E. ½ E.	28.96	80	77	S. E. by E.	E. S. E.	E. S. E. ½ E.
27	20 27	33 12	N.N.E. by N. ½ E.	29.95	81	77	E. S. E.	E. ½ S.	E. ½ S.
28	22 05	32 52	15, N. by E.	29.98	82	77	E. ½ S.	E. by N.	E. by N.
29	23 44	32 34	10, N. by E.	29.98	82	76	E. N. E.	E. N. E.	E. N. E.
30	25 52 D. R.	32 16		29.88	73½	73	E. N. E.	E. by S.	E. ½ S.
Dec. 1	28 57	32 19		29.98	71	69	East	S. E. by E.	E. S. E. ½ E.
2	31 10	32 29	3, S. W. ½ W.	29.93	66	66	S. E.	S. E. by E.	E. S. E. to S. by W.
3	32 06	32 14	12, North	29.78	67	66	E. S. E.	East	Calm
4	32 28	30 27	24, N. by E. ¼ E.	29.80	73	67	South	S. S. E.	N. N. E.
5	33 26	29 30	5, East	29.85	75	65	Calm	N. E.	N. N. E.
6	36 08	26 00		29.47	58	61	N. N. E.	N. by W.	N. N. W., S.W. by W.
7	38 02	23 36	79, N. N. E., in 2 days	29.63	54	59	S. W.	S. W.	S. W.
8	39 14	20 47	33, N. by E.	29.90	54	58	S. S. W.	S. by W.	S. W. by S.
9	40 33	17 57	16, N. E. ¾ E.	29.80	55½	53½	W. S. W.	W. N. W.	N. N. E.
10	42 45 D. R.	13 36 D. R.		29.16	55	52	N. N. E. to N. E.	N. N. E. to N. E.	N. N. E.
11	44 21 D. R.	9 47 D. R.		29.20 28.96	48	46	N.W. by W.	N. N. W.	North
12	45 06 D. R.	7 02 D. R.		28.92	46	48	N. by W.	N. N. W.	Calm
13	45 38 D. R.	2 58 D. R.		28.92 29.28	44	45	W. N. W.	S. W. by W.	W. S. W.
14	45 38	1 07 E.	33, N.N.W. ¾ W.	29.48	46	44½	W. S. W.	W. N. W.	N. W.
15	46 27 D. R.	5 30 D. R.		29.28	39	43	N. W. to N. N. E.	N. W., S. W.	W. S. W.
16	46 24	10 57	55, N. N. E., in 2 days	29.30 29.12	47	45	W. S. W.	W. by N., W. N. W.	N. N. W. to N. W.
17	46 50	15 43	23, N. W.	28.96 29.18	43	42	N.W. by W.	West	W. S. W.
18	47 31	19 59	8, N. E. ¾ E.	29.38	44	42	W. S. W., S. W.	W. S. W., N. W.	N. W. to N. N. E.
19	48 12 D. R.	25 08		28.37	40	39	N.N.E., N.E.	N. N. E.	N. W., W. N. W.
20	48 49	30 20	27, W. ½ S., 2 dy's	29.20	38	37	W., W.S.W.	W. S. W.	W. S. W.
21	48 45	35 24	3, W.S. W. ¼ W.	29.40	38	36½	W. S. W.	W. S. W. to W.	W. to S. W.
22	48 57	41 28	5, S. W. ½ W.	29.52	34	38	W. S. W., S. W.	W. S. W.	W. S. W.
23	49 06	46 34		29.49	38	37	W. S. W.	W.S.W., W.	W., N.W. by N.
24	48 59	52 09	12, S. by W.	29.28 29.60	39½	37	North	N.W. by W.	W. N. W. to W.
25	48 08 D. R.	57 41 D. R.		29.39	43½	40½	W. to N.	N. to N. W.	N. W. by W.
26	47 27	62 16	40, 3 W. by W. ½ W., in 2 d'ys	29.24	43	40	N.W. by W.	W. by N.	W. by N.

Abstract Log of the Ship Malay—Continued.

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Bar.	THER. 9 A. M. Air.	Water.	WINDS. First part.	Middle part.	Latter part.
Dec. 27	46°33′ S.	68°12′ E.		29.30	46°	40°	West	W. by S.	W. by S.
28	46 06	73 39		29.49	44	42	West	West	W. S. W.
29	45 37 D. R.	79 14 D. R.		29.00	49	45	W. to N. W.	N. W. to N.	N. to N. W.
30	45 51 D. R.	84 20 D. R.		28.98 29.25	48	49	W. N. W., N. W.	N. W. by W.	West
31	45 41 D. R.	88 20 D. R.		29.60 29.50	49	47	W. by S.	W. N. W.	N. W. to N.
1854									
Jan. 1	45 41	94 00		29.33 29.62	48	46	North	N. W., W. N. W.	W. by S.
2	45 35	98 05	9, N. by E. ½ E.	29.73 29.67	50	48½	W. S. W.	W. S. W., W. N. W.	North
3	45 42 D. R.	103 28 D. R.		29.50 29.52	55	49	N. N. E.	N. by W.	N. W. by W.
4	45 41 D. R.	108 33 D. R.		29.70	54	49	N. W.	W. N. W.	W. N. W.
5	45 43	112 41	20, E'ly, in 3 d'ys	29.97	57	48½	West	W. by S., W. by N.	West
6	45 49	118 34		29.85	56	52	W. N. W.	W. N. W., N. W.	W. N. W.
7	45 07	124 32	13, N.E. by E. ¾ E.	29.70	53	52	W. by N.	West	W. by S.
8	44 32	128 44		29.95	52	52	W. S. W.		W. by S.
9	44 16	133 18		29.98	55	53	West	N. W.	North
10	44 01	138 59	5, South	29.66	57	54	N. by E.	N. by E.	N. by E.
11	43 48 D. R.	142 46		29.38	58	55½	N. N. E.	N. by E.	W. N. W. to W.
12							S. W.	S. W.	W. to S. W.

Nov. 22. Light breezes; passed about 12 miles west of Fernando de Noronha.

Nov. 23. Light breezes; passed about 12 miles west of Fernando de Noronha.

Nov. 24. Light breezes first part; afterwards, fresh breezes.

Nov. 25. Latter part, puffy weather, with smart squalls; split flying jib and mizzen royal.

Nov. 26. Moderate and pleasant.

Nov. 27. Middle and latter parts, very light.

Nov. 28. Very light breezes; heavy S. S. E. swell; lost the trades.

Nov. 29. Very light breezes.

Nov. 30. Very light breezes; latter part, fresh, with squally, rainy weather.

Dec. 1. Fresh gales, with rain; under double-reefed topsails for three hours.

Dec. 2. Light breezes, cloudy; heavy swell southeastward.

Dec. 3. Very light airs, cloudy weather; latter, pleasant.

Dec. 4. Rolling southwesterly swell.

Dec. 5. Latter part, a light breeze, with fine weather.

Dec. 6. At 4 A. M., squally, rainy weather, with strong wind; in light sails; single-reefed topsails. At 9, wind hauled quickly to W. S. W., and stopped raining. Ends with strong S. W. winds, cloudy weather.

Dec. 7. During this day, strong gales, with very hard squalls, and a heavy cross sea from N. W. to S. W.; double-reefed topsails, and reefed mainsail.

Dec. 8. 4 P. M., made all sail; heavy, long swell from W. S. W.

Dec. 9. First and middle parts, light airs; latter part, strong winds; water, at noon, 52°.

Dec. 10. At 8 P. M., took in light sails; at midnight, double-reefed topsails; at 2 h. 30 min., took in mainsail; at 5, close-reefed, blowing a very hard gale, cutting rain, considerable sea.

Dec. 11. Commences with moderate winds; at sunset, all light sails set; 8 A. M., in light sails; noon, close reefed. Weather squally and threatening, a strong northerly wind.

Dec. 12. Commences fresh N. E. gales; thick, rainy weather; latter part, very light air.

Dec. 13. First, light airs; middle, fresh, with squalls; latter, fresh, with foggy weather; cloudy throughout. Saw kelp.

Dec. 14. Light breezes and foggy weather. Longitude and latitude taken indifferently.

Dec. 15. First and middle, moderate breeze and foggy; latter, fresh and rainy, wind rising. Longitude taken indifferently.

Dec. 16. 1 P. M., double-reefed; 8 P. M., light sails set; latter part, light airs and clear.

Dec. 17. During this day, moderate breezes, with fresh squalls; also fog and rain. Latitude taken indifferently.

Dec. 18. During this day, light breezes and cloudy. Saw sperm whales.

Dec. 19. 8 P. M., double-reefed topsails; at 12, reefed foresail; at 9 A. M., close-reefed topsails; ends with a furious gale, heavy swell. Saw right whales.

Dec. 20. Commences with a severe gale; at 6 P. M., let reefs out to avoid the sea; ends with fresh winds, heavy westerly swell.

Dec. 21. Light breezes, with frequent snow squalls. Passed an iceberg; air, 1° colder; no change in water. Shall go no further south, as my crew are not suitably provided.

Dec. 22. Fresh breezes, with frequent snow squalls. Put a man in irons for refusing duty.

Dec. 23. First and middle parts, light breezes, with snow squalls; ends fresh winds, cloudy, blowing weather. Latitude taken indifferently.

Dec. 24. Strong winds and rain; middle, fresh breezes and foggy; latter part, light breezes and foggy. Passed kelp—also a kind of diving water-fowl.

Dec. 25. Moderate and foggy; middle and latter parts, fresh breezes, thick fog; ends rain.

Dec. 26. Fresh breezes, with very thick, heavy fog; latter part, light.

Dec. 27. Strong breezes; fine weather; squalls occasionally; considerable sea.

Dec. 28. Fresh breezes, with squalls; middle and latter parts, more moderate, with cloudy weather.

Dec. 29. Light and cloudy; middle and latter parts, strong winds, and rainy weather; at noon, wind moderated down at once, and stopped raining.

Dec. 30. Light breezes, and pleasant; middle part, moderate and rainy, with fresh squalls; latter part, fresh gales, with squalls, heavy sea running.

Dec. 31. First part, fresh breezes and squally; middle and latter parts, very light and cloudy. At 10 A. M. more albatrosses around than in all the two weeks before.

January 1, 1854. Strong winds, and rainy; middle, moderate and foggy; latter part, fresh breezes and cloudy.

Jan. 2. First and middle, very light breezes; cloudy weather; saw kelp; also several whales. Latter part, fresh winds and cloudy weather.

Jan. 3. Moderate breezes and fine rain for first and middle parts; latter, thick fog.

Jan. 4. First and middle, fresh breezes and fog; latter part, very light breezes, with thick fog. Kelp.

Jan. 5. First part, calm; middle and latter parts, moderate breezes, fine weather. Saw much kelp.

Jan. 6. Moderate and pleasant; middle and latter, strong winds and cloudy, considerable sea. Spoke ship Wilson, 98 days from England for Melbourne. Saw kelp.

Jan. 7. First and middle, strong winds and cloudy; latter part, moderate breezes and fine weather; heavy westerly swell. Considerable kelp.

Jan. 8. First and middle, moderate breezes and hazy weather; latter part, light breezes with fine weather. Saw much broken kelp.

Jan. 9. Light breezes and fine weather; middle, light breezes, with cloudy weather; latter part, strong winds and cloudy. Broken kelp.

Jan. 10. During this day, strong winds, with hazy weather. Saw broken kelp.

Jan. 11. First and middle parts, strong winds, with very hazy weather; single-reefed topsails; wind suddenly died away, and hauled to W. N. W.; in less than an hour, was back to north, very light; heavy swell; cloudy weather; out all reefs.

Jan. 12. In a thick rain the wind hauled suddenly to S. W.; commenced blowing fresh; at 4 A. M., S. W. Cape bearing about N. E. by N.; at noon, Three Hillock Point W. ½ N., Tasman's Head N. E., Pedro Blanco S. by E.; at 6 P. M. took a pilot; at 7¼, anchored in Hobart Town.

Ship Nightingale (J. B. Fisk), from off St. Roque to Australia.

Nov. 27, 1852. Lat. 7° 24′ S.; long. 32° 08′ W. Wind: S. E.; weather pleasant.

Nov. 28. Lat. 10° 55′ S.; long. 31° 30′ W. Winds: S. E. to E.; made sail as required; pleasant.

Nov. 29. Lat. 13° 19′ S.; long. 30° 00′ W. Winds: S. E. to E.; pleasant; all sail set.

Nov. 30. Lat. 14° 49′ S.; long. 29° 44′ W. Winds: S. E. to E. N. E.; light winds, and baffling.

Dec. 1. No observation; 156 miles distance; course, S. E. Winds: E. N. E. to N. E.

Dec. 2. Lat. 18° 05′; long. 25° 42′. Winds: E. N. E. to N. E.; first part, pleasant; latter, squally.

Dec. 3. Lat. 19° 48′; long. 22° 54′. Winds: E. N. E. to N. E.; weather in general, good.

Dec. 4. No observation; distance, 246 miles. Wind: N. E.; strong winds, thick and cloudy, and rain at intervals.

Dec. 5. Lat. 23° 12′; long. 15° 17′. Wind: N. E.; strong winds; at times squally and rainy.

Dec. 6. No observation; distance, 180 miles; course, S. E. by S. ½ S. Winds: N. E. to E. Commences strong N. E.; latter part, calm. Wind: N. N. W.

Dec. 7. No observation; distance, 142 miles, S. S. E. Winds: S. S. W. to S. E.; variable, squally, and rainy.

Dec. 8. Lat. 30° 41′ S.; long. 12° 39′ W. Wind: S. E. mostly; strong gales; one reef in topsails, standing southerly.

Dec. 9. Lat. 33° 52′; long. 12° 12′ W. Winds: S. E. to E. S. E. Commences strong breezes; ends light.

Dec. 10. Lat. 35° 49′ S.; long. 10° 01′ W. Winds: E. by S. to E.; gentle and pleasant.

Dec. 11. Lat. 37° 55′ S.; long. 6° 20′ W. Winds: N. E. to N. N. E.; gentle and pleasant.

Dec. 12. Lat. 39° 40′ S.; long. 1° 07′ W. Winds: N. N. E. to N.; at times, squally; distance, 263 miles.

Dec. 13. No observation; 186 miles distance; course, S. E. by E. Winds: N. W. to W. S. W.; weather generally good.

Dec. 14. Lat. 39° 57′ S.; long. 5° 00′ E. Winds: S. W. to W. S. W.; weather, generally good.

Dec. 15. Lat. 40° 13′ S.; long. 8° 32′ E. Winds: W. S. W. to W. N. W.; winds light; all sail set.

Dec. 16. Lat. 40° 00′ S.; long. 13° 15′ E. Winds: N. W. and W. N. W.; generally good weather.

Dec. 17. No observation; 278 miles distance; course, S. E. ½ E., N. W. by W. to S. S. W. From royals to double reefs; ends strong gales.

Dec. 18. Lat. 40° 36′ S.; long. 23° 45′ E. Winds: S. S. W. and N. W. Commences strong gales; ends light winds, S. S. W.

Dec. 19. Lat. 41° 07′ S.; long. 27° 38′ E. Winds: W. to N. E. Commences westerly; ends N. E., all sail set.

Dec. 20. Lat. 42° 14′ S.; long. 32° 18′ E. Wind: N. by E.; all these 24 hours fresh breezes and pleasant.

Dec. 21. No observation; distance, 120 miles, S. E. Winds: N. N. E. to N. W. Commences cloudy; latter part, foggy, very thick.

Dec. 22. No observation; distance, 140 miles S. E. Wind: N. E. by E.; all these 24 hours, light winds.

Dec. 23. No observation; distance, 169 miles S. E. by S. Winds: E. N. E. to N. W. Commences thick fog; latter part, strong N. W. gales.

Dec. 24. Lat. 44° 58′ S.; long. 47° 00′ E. Wind: N. W. From royals to double reefs; rolling heavy.

Dec. 25. No observation. Wind: N. W.; strong gales; took in and made sail as required.

Dec. 26. No observation. Long. 57° 17′ E. (D. R.), 220 miles distance. Wind: N. W. to N.; all these 24 hours, weather more moderate, thick.

Dec. 27. Lat. 44° 58′ S.; long. 62° 30′ E. Wind: north. Commences gentle; ends strong.

Dec. 28. Lat. 45° 17′ S.; long. 68° 13′ E. Wind: N. N. E. mostly; latter part, wind canted to southerly board.

Dec. 29. Lat. 45° 19′ S.; long. 71° 58′ E. Wind: S. W. to N. E.; wind from S. W. first part; latter part, N. E.

Dec. 30. Lat. 45° 29′ S.; long. 76° 54′ E. Wind: N. W. mostly. Commences light and variable; latter part, strong northerly.

Dec. 31. Lat. 45° 31′ S.; long. 83° 40′ E. Wind: north; strong northerly winds; distance, 290 miles.

Jan. 1. No observation. Long. 89° 10′ E. (D. R.). Wind: N. ½ W.; all these 24 hours, fresh northerly winds.

Jan. 2. Lat. 44° 31′ S.; long. 94° 15′ E. Winds: N. to N. W. Commences strong; ends light.

Jan. 3. Lat. 44° 03′ S.; long. 100° 03′ E. Wind: N. W. Commences gentle; ends strong.

Jan. 4. Lat. 44° 20′ S.; long. 105° 18′ E. Winds: N. N. W. to W. N. W. Commences strong; ends more moderate.

Jan. 5. Lat. 43° 06′ S.; long. 110° 37′ E. Winds: W. to N. W. mostly; strong gales all these 24 hours.

Jan. 6. Lat. 42° 20′ S.; long. 115° 16′ E. Winds: W. to W. N. W.; mostly strong gales and hazy.

Jan. 7. Lat. 41° 56′ S.; long. 121° 02′ E. Winds: W. N. W. to N. N. W.; all these 24 hours, strong gales.

Jan. 8. Lat. 41° 30′ S.; long. 126° 55′ E. Winds: N. W. to N. Commences strong gales and clear; ends rainy.

Jan. 9. Lat. 41° 54′ S.; long. 130° 06′ E. Winds: N. to S. Commences strong; ends light, wind south.

Jan. 10. Lat. 40° 44′ S.; long. 131° 40′ E. Winds: S. to N. Commences light southerly; ends light northerly.

Jan. 11. Lat. 40° 56′ S.; long. 135° 10′ E. Winds: N. to N. W.; all these 24 hours, light winds.

Jan. 12. Lat. 41° 55′ S.; long. 138° 00′ E. Winds: N. E. to E.; winds variable from eastward.

Jan. 13. Lat. 44° 04′ S.; long. 142° 00′ E. Winds: N. N. E. to N.; squally weather; heavy sea.

Jan. 14. Lat. 44° 36′ S.; long. 147° 00′ E. Winds: N. to N. W.; wind variable; making good head way, 220 miles distance.

Jan. 15. Lat. 44° 01′ S.; long. 148° 45′ E. Winds: N. N. W. to W.; baffling and light.

Jan. 16. Lat. 41° 34′ S.; long. 151° 13′ E. Winds: W. S. W. to N. W. by W.

[On her last trip, the abstract of which has not yet come to hand, this ship went as far south as 57°, and made the best run that has, as far as I know, been yet made between the parallel of St. Roque and Australia.]

A correspondent has sent me the following account of the Flying-Scud's passage from New York to Australia, said to be copied from the *Melbourne Argus*. I have not yet received her abstract log, and, therefore, cannot certify as to the correctness of her surgeon's statements. I have no doubt that those "brave west winds" of the extra-tropical south are capable of giving a speed to canvas, for days together, that has never yet been attained, out upon the ocean and for an equal length of time, by steam. But there seems to be a mistake as to the incredible run of 6,420 nautical miles, of Mr. Stratford, in 16 days. According to

him, the ship went, in 16 days, from lat. 45° 47′ S. and long. 32° 6′ E. to lat. 42° 30′ S. and long. 139° E. The distance between these two positions is about 4,620 miles, which was probably made 6,420 by a slip of the pen. I have not the log, and therefore cannot speak as to the distance actually run, for I know nothing as to the detour which the track of the ship may make from a rhumb-line on the chart; but, with fair winds a detour of 1,800 miles in 4,620—38 per cent.—would be very extraordinary. But, admitting a mistake here, the other statements are interesting, for they are another practical illustration as to the time which vessels save on this voyage by going south of the Admiralty route:—

Copied from Melbourne Argus, Dec. 2, 1853.

Arrival of the Flying-Scud.—The clipper ship Flying-Scud, Captain W. H. Bearse, one of R. W. Cameron's celebrated Pioneer Line of Australia Packets, sailed from New York with one hundred and forty passengers, on Thursday, September 28, crossing the Gulf Stream with a strong northerly breeze on the 30th of September. At 8 P. M. the ship was struck with lightning. The first flash struck the ship forward, knocking down several men; one man was brought into the cabin incapable of standing from the shock, from which, however, he recovered in a short time. All felt their legs go from under them, and their nerves were greatly influenced by the electricity. The second flash struck the ship abaft the main and mizzen-mast; this also knocked down most of the hands on deck, and, curious to observe, it had a great effect upon the compass. When first observed, the needle revolved with great velocity, and this continued for some time; when it ceased, the compasses were found to be considerably changed, and it was afterwards discovered that they varied five points to the eastward of their true bearing, which, after a lapse of five or six days, diminished to three points. These facts were clearly proved by the position of the sun and the bearing of the north star. In consequence of this derangement of the compasses (five in number), it was necessary to lay the ship to under close-reefed topsails for eighteen hours, although the wind was perfectly fair, and the ship might have run one hundred and fifty miles at least. It would appear that the lightning struck the mizzenmast and descended by the lightning-rod to the channels. The wind appeared to blow the copper wire of the rod against the chains, and here it was conducted through the bolt into the interior of the ship, where it magnetized a large quantity of iron and steel implements which were in the afterhold. To prove that these were the seat of attraction, Captain Bearse placed a compass in all parts of the ship. The influence varied in different places. On the topgallant-forecastle, the compass seemed somewhat to return to its proper bearing; abaft the mainmast, the influence was much stronger; and in the after part of the ship it was most potent. Placed upon the cabin floor, the compass still revolved with considerable velocity. On a board placed ten feet out upon the larboard side of the ship, the compass was found to become nearly correct; by this means the true course of the ship was found. The influence above mentioned prevailed during most of the passage, until the 7th December, in lat. 43° 45′ S. and long. 110° 15′ E., where the compasses seemed to become more correct, being found to vary but ¾ of a point to the eastward. It is also worthy of notice, that in this region several claps of thunder and lightning were observed, and that these were followed by thick foggy weather, which precluded the possibility of any observation for four

days. When this was obtained, the ship was found to be 150 miles to the southward of her true course in consequence of steering by the compass, supposing it to possess the same variation which has just been mentioned; but, when observation was obtained, the compass was found to have returned to its true bearing, and thus was the course of the ship deranged, and her voyage unnecessarily protracted. On the first of October, after the true bearing of the compasses had been discovered, sail was made with a northerly wind, and the ship reached the region of the northeast trades on the 12th October, but found only light airs and baffling winds from southward and eastward. The southeast trades, however, were reached on the 23d of October, in lat. 5° 18′ N. and long. 30° 27′ W.; there found strong whole-sail breezes, and kept with the ship until Sunday, November 5, in lat. 27° 41′ S. and long. 29° 30′ W. The ship was then steered eastward with strong northerly and westerly breezes, the ship often going fifteen or sixteen knots in the hour. On Monday, the 6th of November, the ship ran the very large amount of 449 nautical miles in the twenty-four hours. After some calms and occasional gales from the eastward, which continued until the ship arrived on the 12th November in lat. 43° 48′ S., long. 5° 3′ E., she again obtained strong gales from the westward (this was evidently the westerly passage wind laid down in Lieutenant Maury's Sailing Directions), which continued with the ship, with but slight intermissions, until she arrived in lat. 43° 3′ S., long. 139° E., on the 10th December. On the 24th November, the ship was in lat. 45° 47′ S., and long. 32° 6′ E., and arrived, as before stated, on the 10th December, in long. 139° E., running the immense amount of 6,420 nautical miles in sixteen continuous days, thus averaging upwards of 400 miles per day. Taken as a whole, this voyage of the Flying-Scud appears to have been one of the most successful attempts at speedy navigation accomplished by any vessel out of New York going eastward, since a due appreciation has been had of circular sailing, so beautifully and elaborately detailed by Lieut. Maury, United States Hydrographer. It was accomplished by the Flying-Scud under very considerable disadvantages, viz: she being two feet out of trim, having a very heavy deck load, and being extremely crank upon a side wind, which precluded the possibility of carrying the amount of sail that she was otherwise able to do. It should have been noticed, that the Flying-Scud crossed the equator on Tuesday, 26th of October, in long. 32° 41′ W.; at the same time it should be remarked, that notwithstanding the compass appeared to have a true bearing in long. 139° E., lat. 42° 30′ S., it again became deranged in long. 143°, lat. 41° 3′ S. This time the variation was 2½ points to the westward; and this variation has continued, and may still be observed on board the ship by any person desirous of observing the same. "Passage, 80 days."

Signed, D. J. STRATFORD, *Surgeon.*

Abstract Log of the Ship Parana (F. B. LANGSTON). *From off St. Roque to Sydney, Australia.*

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Bar.	THER. 9 A. M. Air.	Water.	WINDS. First part.	Middle part.	Latter part.
1853									
Dec. 10	7°16′S.	33°12′W.	None	29.83	82°	81°	E. S. E.	E. by S.	E. by S.
11	10 05	33 41	None	29.84	82	81	S. E. by E.	E. S. E.	E. S. E.
12	12 31	33 01	None	29.84	81	81	E. S. E.	East	E. and E. N. E.
13	15 22	31 33	None	29.87	83	81	E. by N.	E. N. E.	E. N. E.
14	17 42	29 46	None	29.84	81	79	E. N. E.	N. E. by E.	N. E.
15	20 30	28 31	No observation	29.80	79	78	North	North	North
16	22 30	26 22	No observation	29.77	78	77	N. N. W.	N. N. W.	N. N. W.
17	23 47	25 02	No observation	29.90	78	76	N. by W.	North	N. to W. S. W.
18	23 55	24 06	None	29.94	78	77	S. W. & Calm	Calm	N. E.
19	25 18	22 16	N. 24, E. 18	29.90	76	75	North	N. N. W.	N. N. W.
20	27 03	20 39	N. 10	29.80	74	73	N. N. W.	N. N. W. & N. by E.	N. by E.
21	28 27	18 13	No observation	29.80	70	72	N. & N. by W.	N. N. W. & S. S. W.	S. by W.
22	27 09	15 41	None	29.90	71	72	S. S. E.	S. S. E. & Baffl.	S. S. E.
23	28 40	16 18	None	30.04	71	73	S. E. by S.	S. E.	S. S. E.
24	31 41	15 16	None	29.90	70	66	E. S. E. & E.	E. & E. N. E.	E. N. E. to N. N. E.
25	34 30	13 43	None	29.80	78	64	North	N. & N. N. W.	N. W.
26	36 51	12 29	None	29.65	64	61	N. W.	West	N. W. & N. N. W.
27	38 16	9 08	None	29.84	57	55	W. N. W.	N. W.	N. W. by W.
28	39 14	6 06	No observation	29.93	58	55	N. W. by W.	North	N. & N. N. E.
29	40 00	1 38	No observation	29.90	58	56	North	North	N. & N. by W.
30	40 12	2 43 E.	None	29.82	56	53	N. by W.	N. N. W.	N. W. by N.
31	40 44	6 30	No observation	29.78	57	54	N. W.	W. N. W.	N. W.
1854									
Jan. 1	41 05	10 54	N. 40, in 2 days	29.54	57	59	N. W.	N. N. W.	N. W.
2	41 42	15 38	N. 22, last 24 hrs.	29.52	54	58	W. N. W. to W. S. W.	W. S. W.	West
3	42 31	20 35	N. 19	29.54	50	55	West	West	W. & W. N. W.
4	43 28	24 58	W. 9, in 24 hrs.	29.52	48	51	N. W. by N.	N. W.	W. N. W. & W.
5	44 18	29 45	N. 49, E. 14	29.46	53	49	W. & W. N. W.	N. W. & N.	North
6	45 06	34 16	None	29.02	49	45	N. by E.	N. by E. & N.	N. W. & N.
7	45 06	38 52	N. 45, W. 17	29.08	46	43	North	N. W.	N. W.
8	44 36	43 30	N. 45, W. 22	29.35	42	43	N. W.	W. N. W.	West
9	44 58	48 36	No observation	29.43	46	41	West	W. by S.	N. W.
10	45 09	52 53	None	29.58	47	44	N. W.	N. W.	N. W. by N.
11	45 57	57 43	None	29.50	48	44	N. N. & N.	N. N. E.	N. N. E.
12	46 50	62 29	No observation	29.15	52	46	N. by E.	N. N. E. & N. E.	N. E. by E.
13	46 31	66 09	None	29.20	44	41	N. E. by E.	N. N. E. & N.	N. & N. by W.
14	46 41	79 53	None	29.36	44	42	N. & N. N. E.	N. E. by N.	N. W.
15	46 21	75 32	None	29.76	48	45	N. W.	N. W. & N. N. W.	N. & N. N. E.
16	46 29	80 38	None	29.76	49	45	N. & N. N. W.	N. N. W. & N. W.	N. W.
17	46 30	85 50	No observation	29.58	51	50	N. W. & N.	North	North
18	46 23	90 07	None	29.66	49	46	North	N. N. W. & N. W.	W. S. W.
19	46 30	95 07	No observation	29.57	49	46	W. & N. W.	North	N. N. W.
20	46 33	100 58	No observation	29.50	53	46	N. N. W.	N. N. W.	N. N. W.

Abstract Log of the Ship Parana—Continued.

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Bar.	Ther. 9 A. M.		Winds.		
					Air.	Water.	First part.	Middle part.	Latter part.
Jan. 21	46°36′S.	105°24′ E.	None	29.42	46°	46°	N. N. W. & N. W.	W. by N.	W. S. W.
22	46 08	110 51	None	29.64	45	45	W. by S.	W. S. W.	West
23	46 20	116 12	No observation	29.60	50	49	West	W. & W.N.W.	N. W.
24	46 15	121 26	N. 21, in 48 hrs.	29.50	50	49	N. W. by W.	West	West
25	46 32	126 23	None	29.41	49	51	West	West	West
26	46 30	131 17	No observation	29.25	51	51	West	West	N. W.
27	46 25	136 44	None	29.32	52	51	W. by N.	W. by N.	W. by N.
28	45 48	142 08	S. 54, W. 15	29.53	55	53	W. by N.	W. N. W. & N. W.	N. W.
29	45 31	146 48	None	29.22	58	54	N. W. & N. N. W.	N. by W.	N. by W.
30	43 31	150 21	None	29.50	59	62	N. N. W. & W.	W. by N.	W. by N. & W. N. W.
31	42 46	152 19	None	29.20	64	62	North	N. & N. W.	N. W.
Feb. 1	40 05	152 36	None	29.70	60	64	N. W.	S. S. W.	W. S. W.
2	38 19	152 32	None	29.84	65	65	West	West	W. & N. W.
3	37 26	153 01	None	29.80	69	69	N. W.	N. N. W.	N. N. W.
4	35 45	151 53	None	29.78	69	69	N. N. W.	S. S. E.	Baffl. S. & S.S.E.
5							S. S. E.	S. S. E.	S. S. E.

Dec. 10. Commences with light wind and light passing cirro-cumulus clouds. 8 P. M. a fine breeze and cloudless sky. Midnight, a light breeze and light clouds. Ends with a moderate trade and light passing clouds.

Dec. 11. Commences with a moderate breeze and light passing clouds. Midnight, weather the same, breeze freshening a little. Ends with a moderate breeze, a light squall gathering in eastern horizon.

Dec. 12. Commences with light breeze and fine weather. 1 P. M. had a fresh squall. 3.30 P. M. wind died away nearly calm, after a fresh squall with rain. 7 P. M. had a fresh squall with rain. 8 P. M. the breeze freshened at east, sky overhead perfectly clear, some cirro cumulus clouds in eastern horizon. Midnight, a light breeze and light passing cirro-cumulus clouds. 4 A. M. a few light squalls. Ends with a light breeze and light cirro-cumulus clouds.

Dec. 13. Commences with a light wind and light passing clouds. 1.30 P. M. spoke the barque Victory, of Baltimore, 46 days from Baltimore, bound to Monte Video; the captain told me he had the winds from E. S. E. all throughout the region of the N. E. trades; that he had to beat all the way to the line; that he had to cross in 30° W., not being able to get as far east as he wanted. He has had the winds as I have had them, two or three voyages that I sailed in October. Middle and latter parts, a fresh breeze and light passing clouds.

Dec. 14. Commences with a fresh breeze and light passing clouds. Midnight, a fresh breeze and hazy weather. Ends with light breeze and hazy weather.

Dec. 15. Commences with moderate breeze and slightly smoky weather. Midnight, a moderate breeze

and hazy weather. Daylight, a fresh breeze and smoky weather; clouds gathering to the westward. 10 A. M. squally with spits of rain. Ends with a strong breeze and squalls with rain.

Dec. 16. Commences with fresh gale, squalls and heavy rain; saw large numbers of birds. 6 P. M. heavy rain. 8 P. M. clouds breaking away and breeze freshening, clouds passing from various directions. Midnight, a fresh breeze and cloudy weather. 4 A. M. a light breeze and misty showers. Ends with a light wind and misty showers with overcast weather.

Dec. 17. Commences with light breeze, squalls and thick of rain. Sundown, clear to the west, with heavy nimbus clouds to the eastward, and misty rain over the ship. 7 P. M. lightning to the north, with two or three claps of thunder, appearance of heavy squall; took in all the light sails; the cloud rose up overhead and then dispersed, leaving us with very little wind. 10 P. M. had all sail on the ship again. Midnight, a light wind with passing showers of rain; upper clouds passing rapidly from the west. Sunrise, wind light and variable with heavy showers of rain. 10 A. M. wind hauled to W. S. W. Ends with a light breeze and rain.

Dec. 18. Commences with light breeze and rain. Middle part, calm and overcast. 4 A. M. took a light air from the N. E. Ends with a light air and hazy. There must be more variation to the west here than laid down on charts, or else my compasses vary more; overhauled all around the binnacle, but can find nothing to attract them; my binnacle is a single one; but having tried another compass farther forward, and the tell-tale in the skylight, all agree.

Dec. 19. Commences with light winds and light passing clouds. Sundown, a light breeze and light smoky clouds to the W. and S. W. Midnight, a light breeze and light clouds. Daylight, breeze freshened. Ends with a moderate breeze and light clouds.

Dec. 20. Commences with light breeze and light passing smoky clouds. 8 P. M. not a cloud above the horizon; sea very smooth. 11 P. M. the wind hauled to N. by E. and freshened. Midnight, a moderate breeze and light passing clouds. Ends with a fresh breeze, and weather slightly smoky.

Dec. 21. Commences with fresh breeze and overcast weather; rain clouds gathering to the S. W. 4 P. M. commenced raining and wind hauled to the west of north; furled the skysail. 5.30 P. M. jibed ship. 8 P. M. squally with rain; furled royals, took in topgallant studding-sails. 10 P. M. had two flashes of lightning to the southward, after which the wind hauled to S. S. W.; took in the topmast studding-sail and braced up. Midnight, a moderate breeze and overcast cloudy weather.

Dec. 22. Commences with a moderate breeze and overcast weather. This evening noticed the first long westerly swell we have had this passage S. of equator. .Sundown, wind blowing in varying puffs as a northerly wind on the coast of the United States; clear to westward and eastward. Midnight, a moderate, variable breeze and cloudy; all sail set by the wind. Ends with a light baffling wind and light cirrus clouds; a long southwesterly swell. In comparing, find I have been on the wrong tack; but it has been one of those winds that a ship can do nothing on one tack and less on the other, and I have happened to hit the worst one; I am likewise now confident that either the variation is greater or my compasses show

more. The ship was heading up E. by S. part of the time, and off in flaws to E. ½ N. I judged she would have made at least an east course by compass good, instead of which she has made N. E. by E. true.

Dec. 23. Commences with light breeze and light cirro-cumulus clouds; tacked to southward. Midnight, light airs and light clouds. Daylight, breeze freshening a little. Ends with a light breeze and light cirrus clouds coming from the west.

Dec. 24. Commences with moderate breeze hauling to eastward, and light passing clouds. At 4 P. M. set the larboard foretopmast studding-sail. Sundown, clouds gathering to the S. W.; some of those small mackerel rain clouds to the south. Midnight, a fresh breeze and overcast with a kind of smoky clouds. 2 A. M wind hauling more north, set all the larboard studding-sails. 4 A. M. a fresh breeze and hazy weather. Ends with a fresh breeze and overcast misty weather; a ship on our lee bow, steering the same way.

Dec. 25. Commences with a fresh breeze and overcast misty weather. 2.30 P. M. came up with and spoke British ship Lydia, of and from Liverpool bound to Ceylon, 45 days out. Sundown, the fog cleared off to the westward, sky through the fog looking mild. 7.30 P. M. water, 65°; air, 68°; water having the appearance of being on deep soundings. Midnight, a strong breeze and dark overcast misty weather, jibed ship and took in all but the foretopmast studding-sails. 2 A. M. had a heavy shower of rain. 4 A. M. thick fog. 6 A. M. cleared off some, made all sail before the wind. During the forenoon sometimes foggy, at others, the sun shone through. Ends with a fresh breeze and some fog clouds to southward and westward.

Dec. 26. Commences with a fine breeze and some fog clouds to southward and westward, some cirro-stratus clouds aloft. 4 P. M. wind died away and set in thick fog. 8 P. M. light wind and thick fog with misty rain. Midnight, the same. 4 A. M. the breeze freshening with thick fog. 10 A. M. sun broke through the fog, got a sight for chronometer. From 11.30 to noon sun broke through the fog; got the latitude, after which it set in thick fog. Ends with a fresh breeze and thick fog.

Dec. 27. Commences with a fresh breeze and thick fog. 1 P. M. the fog lifted; made the island of Tristan D'Acunha, bearing S. S. E., the west end; passed to the northward and eastward of it; find my chronometer true; passed several patches of kelp to the east of the island. 7 P. M. passed two barques and one ship on the wind, whalers. Midnight, a fresh breeze and clear. 11.30 A. M. saw two right whales. Ends with a fresh breeze and perfectly clear, not a cloud above the horizon.

Dec. 28. Commences with moderate breeze and clear weather; all sail set; some long westerly swell. Sundown, a light wind and some smoky stratus clouds to the westward. 8 P. M. wind light and hauling to the northward; jibed ship, took in the starboard studding sails; fresh breeze and cloudy. 7 A. M. canting to eastward; took in the lower and maintopmast studding sails. During the forenoon saw great numbers of small gray gulls. Ends with a thick fog and misty rain; breeze fresh.

Dec. 29. Commences with a fresh breeze and thick fog with misty rain. 1.30 P. M. fresh flaws; furled the skysail and took in fore-topgallant studding-sail; passed considerable kelp, some large bunches and a great deal of detached particles. 4 P. M. wind hauling more north; set the lower and main topmast studding-sails. 8 P. M. a fresh breeze and thick of rain. Midnight, a fresh breeze, thick fog with misty rain. 4 A. M. weather the same; set the skysail and royal studding-sail. Ends with thick fog and moderate breeze.

Dec. 30. Commences with moderate breeze and thick fog, all sail set. 7.30 P. M. fog cleared off from the water. 10 P. M. water very phosphoric; took in the royal studding-sail and skysail. Midnight, a fresh breeze and thick fog. 4 A. M. weather the same. 10 A. M. fog lifted a little so that I got a sight of the sun. At noon the fog cleared a little, got an indifferent observation for latitude.

Dec. 31. Commences with fresh breeze and thick fog, all sail set. 8 P. M. thick foggy weather; took in the royal studding-sail. 10 P. M. jibed ship, took in the larboard and set the starboard studding-sails. Midnight, a moderate breeze and thick foggy weather. 2 A. M. wind hauled to N. W. again; jibed and set the starboard studding-sails. 4 A. M. thick fog and moderate breeze. Ends with moderate breeze, thick foggy weather and smooth sea. So ends 1853 in these parts.

Jan. 1, 1854. Commences with a moderate breeze, thick fog and a smooth sea. At 1 P. M. the fog cleared away, giving us a glimpse of a most splendid blue sky. 4 P. M. set in thick fog again; air, 57°; water, 54°. 8 A. M. air, 57°; water, 55°. Midnight, a fresh breeze and fog. 3 P. M. breeze freshening; took in the royals and main topmast studding-sail. 4 A. M. air, 57°; water, 56°. 8.30 A. M. breeze increasing and hauling more west; took in fore and mizzen royal, spanker and crossjack. Ends with a fresh gale and passing clouds; took in main royals and all studding-sails.

Jan. 2. Commences with a fresh gale and overcast cloudy weather. 3 P. M. heavy squalls; took in all the light sails and double-reefed the topsails. 4 P. M. air, 58°; water, 48°. 7 P. M. more moderate; set topgallant sails and shook out all reefs, set jib and mainsail. 8 P. M. air, 56°; water, 50°. Midnight, a strong breeze and overcast cloudy weather. 4 A. M. squally; put a single reef in; air, 52°; water, 58°. 8 A. M. more moderate; shook out all reefs; set main royal. Ends with a strong breeze and flaws; furled the royals and spanker; air, 55°; water, 55°.

Jan. 3. Commences with a strong breeze and passing clouds; saw great numbers of small birds somewhat similar to the small birds seen along the northeastern edge of the Gulf Stream. 2 P. M. water, 54°. 4 P. M. set the main royal, lower studding-sail and spanker; air, 52°; water, 50°. Sundown, had a few light squalls. 8 P. M. a strong breeze and passing clouds; air, 49°; water, 50°. Midnight, a strong breeze and fresh squalls. Daylight, weather the same, with spits of rain. 4 A. M. air, 49°; water, 53°. 8 A. M. set fore and mizzen royal and topgallant studding-sails. At noon, had some light rain squalls which hauled the wind to westward a little; saw some black winged gulls, same as seen near the islands in South Atlantic; air, 50°; water, 58°.

Jan. 4. Commences with a fresh breeze and squalls with showers of rain. 2 P. M. air, 52°; water, 59°. 4 P. M. air, 52°; water, 59°; had a fresh squall with rain; furled fore and mizzen royals; after the squall the mercury dropped fast, say 29.50 and falling. 6 P. M. barometer, 29.48. 7.30 P. M. had a violent squall from N. W. with rain; took in all the light sails and single-reefed the topsails; barometer, 29.44; air, 50°; water, 58°. Midnight, a strong breeze and squalls. 4 A. M. hard squalls; air, 51°; water, 53°. 6 A. M. more moderate; shook out the reefs, set main royal, fore topmast and lower studding-sails. Ends with a strong breeze and squalls; at noon, got the southern edge of a heavy hail squall; air, 46°; water, 49°.

Jan. 5. Commences with a fresh breeze and squalls. 2 P. M. light squall, after which cleared off beautifully; made all sail. 4 P. M. air, 52°; water, 49°. 8 P. M. light winds hauling to the northward; a bank of clouds up from the westward; air, 46°; water, 48°. Midnight, overcast rainy weather. 4 A. M. weather cleared off a little; barometer, 29.42; air, 49°; water, 48°. 10 A. M. fresh squalls, overcast weather. Ends with a fresh breeze; more clear overhead, but still heavy and angry appearance to the W. S. W.; barometer, 29.37; air, 53°; water, 49°.

Jan. 6. Commences with a fresh gale and passing clouds with smoky weather. 4 P. M. barometer, 29.28, falling; air, 54°; water, 46°. 7 P. M. passed a piece of kelp, longer and larger leaf than seen before; saw several small birds of the clerice [?] species; saw a whale; the water having much the appearance of being on soundings. 8 P. M. air, 52°; water, 46°. Midnight, fresh gale and rain; reefed topsails and furled mainsail; barometer, 29.15, falling. 2 A. M. wind hauled to N. W. and moderate with squally appearance. 4 A. M. barometer, 29.05; air, 52°; water, 45°. 7 A. M. wind hauled to W. again and freshened a little, with rain. 10 A. M. began to clear off to the west. Ends moderate, with blue streak to the west; cloudy to the eastward; barometer, 29.00; air, 48°; water, 45°.

Jan. 7. Moderate breeze, clear to westward, cloudy to northward. 3 P. M. light squalls, after which weather cleared off some. 4 P. M. air, 50°; water, 44°. 8 P. M. barometer, 28.95; air, 46°; water, 44°; furled mainsail, took in fore-topmast studding-sail. 9 P. M. bad looking squall from the westward. Midnight, strong gale with hail squalls; furled topgallant sails; barometer, 28.95. 4 A. M. 29.00, rising; air, 46°; water, 53°; squalls less violent. 6 A. M. set main topgallant sail. Ends fresh gale and passing clouds; saw a great many albatrosses and those small slate colored birds; passed three small bunches of kelp; barometer, 29.12; air, 48°; water, 43°.

Jan 8. Moderate gale and smoky clouds; light sails set; passed kelp. 4 P. M. barometer, 29.15, rising; air, 46°; water, 44°. 7 P. M. wind hauling a little to westward in squalls. 8. P. M. fresh squall with rain; in light sails and mainsail. 11 P. M. breeze more steady. Midnight, fresh breeze and clear atmosphere; squalls occasional. Sunrise, frequent hard squalls with hail and snow; between squalls air remarkably clear and dry; everything turning white from drought. 4 A. M. air, 45°; water, 43°. 11 A. M. fresh squall with hail. Ends fresh breeze and light passing clouds; squalls to the southwestward; kelp; air, 43°; water, 43°.

Jan. 9. Strong breeze and light squalls; all light sail set. 4 P. M. barometer, 29.48; air, 44°; water, 43°; passed kelp. 8 P. M. barometer, 29.48; air, 44°; water, 43°; hard squall, with hail and rain; afterwards, wind continued steady at its old quarter, with cloudy sky. Midnight, moderate and overcast. 4 A. M. barometer, 29.48; air, 44°; water, 42°; wind hauling to northward; overcast and misty. 9 A. M. breezes freshening; shortened sail to it. Ends fresh gale; misty fog; barometer, 29.43; air, 46°; water, 42°.

Jan. 10. Fresh gale; overcast, misty weather. 1 P. M. single-reefed topsails; passed much kelp in long, narrow, ribbon-like pieces. 4 P. M. barometer, 29.48; air, 46°; water, 42°; moderating, out reefs and made sail. Middle, moderate and overcast. 4 A. M. made all sail; barometer, 29.55; air, 44°; water, 42°. 6 A. M. wind inclining more northward. 9 A. M. clear, blue sky; passed quantities of kelp. Ends moderate and hazy; passing clouds; barometer, 29.62; air, 48°; water, 43°.

Jan. 11. Moderate; slightly foggy; steady fog clouds around the horizon; sky rather overcast. 4 P. M. barometer, 29.62; air, 46°; water, 40°; passed kelp; birds very few. 6 P. M. raining. 8 P. M. barometer, 29.62; air, 46°; water, 40°; thick rain; passed kelp like tufts of Brah [?] grass, all but color; wind hauling to eastward. Midnight, strong breeze and thick rain. 4 A. M. barometer, 29.55°; air, 48°; water, 43°; thick rain. 7 A. M. cleared off. Ends strong breeze, and a few cirro-stratus clouds overhead; fog bank to the eastward and westward; barometer, 29.50; air, 50°; water, 44°.

Jan. 12. Strong breeze; smoky weather; fog bank in the eastward cleared off. 4 P. M. barometer, 29.50; air, 52°; water, 46°; bank in west came up in a series of light, smoky cirrus clouds; passed kelp of a new kind, like leaves of cactus. At sundown the light cirrus closed overhead, leaving a clear place to the N. N. E.; breeze died away. 8 P. M. barometer, 29.50; air, 50°; water, 46°. 10 P. M. wind hauled to N. E., and freshened. Midnight, strong breezes, and overcast. 4 A. M. wind hauled more E.; barometer, 29.34; air, 49°; water, 45°. 8 A. M. barometer, 29.24, falling fast; a fresh gale; double-reefed topsails. Ends with a hard gale; thick fog; barometer, 29.08; air, 52°; water, 46°.

Jan. 13. Fresh gale; thick fog. 4 P. M. barometer, 29.00, falling; air, 52°; water, 45°; wind dying away, with thick, foggy weather; one reef out of maintopsail, and set main topgallant sail. 8 P. M. barometer, 28.98; air, 50°; water, 44°. 11 P. M. wind hauling westerly; moderates; make sail. Midnight, light breezes; overcast. 3 A. M. fog cleared off. 4 A. M. barometer, 29.00; air, 44°; water, 40°. During morning, weather variable, sea smooth. At noon, clear and moderate; few cirrus clouds overhead; clear, blue sky to southwestward; saw kelp; barometer, 29.26; air, 45°; water, 41°.

Jan. 14. Light breeze and light cirrus clouds. 2 P. M. saw three long-neck divers. 4 P. M. moderate and clear; barometer, 29.36; air, 48°; water, 41°. 8 P. M. barometer, 29.36; air, 48°; water, 44°. 9 P. M. freshens, and hauling east. Midnight, breeze freshening, with light cirrus and smoky clouds coming from westward; single-reefed topsails, furled fore topgallant sail; barometer, 29.20, falling fast. 2 A. M. furled mainsail. 4 A. M. strong gale, hard squalls, heavy rain; barometer, 29.10; reduced sail to double-reefed topsails; wind hauling to westward in squalls; after the wind got W. N. W., barometer began to rise fast, and the squalls cleared off. 6 A. M. shook a reef out of the maintopsail, set main topgallant sail. 8 A. M. out all reefs, made sail. Ends with a fresh gale; clear weather; barometer, 29.50; air, 45°; water, 43°; saw a whale.

Jan. 15. Fresh gale and clear weather; small piece of kelp, first seen in two days; very dry. 4 P. M. barometer, 29.62; air, 45°; water, 43°. 8 P. M. fresh, and not a cloud; barometer, 29.68; air, 44°; water, 42°; moderating. Midnight, light breeze and passing clouds. 4 A. M. wind hauling gradually to the northward; barometer, 29.74; air, 45°; water, 45°. 8 A. M. wind hauling to eastward, freshening and smoky; kelp. Ends with a fresh breeze, and few light cirrus clouds; barometer, 29.80; air, 51°; water, 46°.

Jan. 16. Fresh breeze, and slightly smoky weather. 2 P. M. a fresh squall, with slight rain; wind hauling to westward again. 4 P. M. fresh breeze, with flaws; barometer, 29.78; air, 50°; water, 46°. 7 P. M. wind freshening in flaws. 8 P. M. barometer, 29.68; air, 50°; water, 46°; fresh gales; clear overhead; hazy at the horizon; furled topgallant sails. Midnight, blowing hard in squalls, with rain; furled

mainsail, double-reefed topsails. 2 A. M. hard squall; wind moderates. 8 A. M. all sail set again; moderate and hazy. Ends light breezes; clear overhead, hazy at the horizon; barometer, 29.80; air, 50°; water, 43°.

Jan. 17. Light winds, and a few light cirro-stratus clouds. 4 P. M. barometer, 29.77; air, 52°; water 44°; wind hauling to northward; fog bank to northward; slightly hazy. 8 P. M. barometer, 29.78; air, 48°; water, 44°; thick fog, misty rain. Midnight, thick fog, misty rain. 3 A. M. breeze increasing; misty rain. 4 A. M. fresh breeze and cloudy; less fog; barometer, 29.68; air, 50°; water, 49°. Ends strong breeze; overcast, misty weather; barometer, 29.50, falling; air, 53°; water, 50°.

Jan. 18. Strong breeze and misty rain. 4 P. M. barometer, 29.44; air, 54°; water, 50°. 6 P. M. wind hauled to westward after a shower of rain, and moderated. 8 P. M. thick fog, with misty rain; barometer, 29.40; air, 52°; water, 46°. Midnight, light wind, thick fog. 2 A. M. wind hauled W. S. W. 4 A. M. barometer, 29.60; air, 49°; water, 46°. Ends light wind, and light cirro-stratus clouds; some smoky clouds to the westward; barometer, 29.70; air, 51°; water, 46°.

Jan. 19. Light air, and some cirro-stratus clouds. 1h. 30 min. P. M. wind hauled to northward of west. 4 P. M. air, 50°; water, 47°. At 8 P. M. breeze freshening; barometer, 29.76; air, 48°; water, 47°. Midnight, strong breezes and overcast. 2 A. M. breeze increasing. 4 A. M. strong breeze; thick fog; barometer, 29.60; air, 48°; water, 47°; some kelp. Ends strong breeze; thick fog; barometer, 29.58; air, 52°; water, 46°.

Jan. 20. Strong breeze and thick fog; passed two pieces of kelp; barometer, 29.58; air, 52°; water, 46°. 8 P. M. barometer, 29.58; air, 50°; water, 46°; fresh breeze; thick fog. Midnight, strong breeze; thick fog. 4 A. M. barometer, 29.52; air, 52°; water, 46°; saw large number of small, short-necked, long-winged, dark-colored gulls. 10 A. M. saw porpoises, with white streaks on their sides; saw kelp. Ends a strong breeze, and thick fog; fewer birds; barometer, 29.47; air, 53°; water, 45°.

Jan. 21. Commences with a strong breeze, thick fog, and misty rain. 4 P. M. barometer, 29.47; air, 49° to 46°; wind dying away, and hauling to the westward. 6 P. M. jibed ship, and made sail; passed several patches of kelp. 8 P. M. barometer, 29.46; air, 45°; water, 46°. Midnight, moderate breezes, and rainy. 2 A. M. wind hauled to W. S. W., and cleared off. 4 A. M. barometer, 29.42; air, 45°; water, 46°; fresh breeze and frequent squalls, with hail and rain; passed several pieces of kelp of various kinds during the morning; some small birds and one albatross in company. Ends strong breeze and passing clouds, with an occasional squall—fresh; barometer, 29.43; air, 46°; water, 46°.

Jan. 22. Commences with a fine breeze and passing clouds. 4 P. M. a fresh hail squall; barometer, 29.48; air, 46°; water, 49°. 8 P. M. fresh squalls, accompanied with hail and rain; barometer, 29.52; air 44°; water, 52°. Midnight, a strong breeze and hard squalls, with hail and rain; between the squalls, faint auroras to the southward. 4 A. M. wind and weather the same; barometer, 29.60; air, 46°; water, 46°; set all sail; during the morning, great numbers of birds, some albatrosses, some large black birds, and great numbers of those short-necked and winged gulls. Ends with a steady, strong breeze; squalls clearing away; some passing clouds; barometer, 29.64; air, 44°; water, 45°.

Jan. 23. Commences with a strong breeze and passing clouds. 4 P. M. barometer, 29.70; air, 47°;

water, 47°; breeze moderating. Midnight, a fresh breeze and light squalls, with spits of rain; wind hauling gradually to the northward. 4 A. M. jibed ship; barometer, 29.62; air, 48°; water, 42°; no birds. 10 A. M. breeze increasing; passed several pieces of kelp. Ends with a fresh gale and rain; barometer, at noon, 29.57; air, 50°; water, 49°.

Jan. 24. Commences with a fresh gale and rain. 4 P. M. barometer, 29.47; air, 49°; water, 49°; passed several pieces of kelp. At 8 P. M. wind moderating, and hauling to the west, with thick, misty rain; barometer, 29.44; air, 50°; water, 52°; jibed ship; weather looking bad. Midnight, strong breeze and cloudy weather. 4 A. M. more moderate; made all sail; barometer, 29.50; air, 50°; water, 50°; passed several pieces of kelp; a few birds. Ends with fresh breeze and light, passing clouds.

Jan. 25. Commences with a fresh breeze and passing clouds; a bank of clouds to the southward and westward. 3 P. M. had a fresh squall, with rain. 4 P. M. barometer, 29.47; air, 50°; water, 50°. 8 P. M. barometer, 29.45; air, 50°; water, 50°. 9 P. M. fresh squalls, with rain. Midnight, barometer, 29.38; a strong breeze, with hard squalls and rain; dark, overcast weather. 4 A. M. barometer, 29.40; air, 48°; water, 50°; passed several large patches of kelp; some albatrosses in company. Ends with a strong breeze and passing clouds; barometer, 29.42; air, 49°; water, 51°.

Jan. 26. Commences with a fresh gale and squalls, with light spits of rain. 4 P. M. barometer, 29.45; air, 50°; water, 50°; passed several pieces of kelp. 8 P. M. barometer, 29.44; air, 50°; water, 51°. Midnight, light winds and cloudy weather. 2 A. M. wind hauled to N. W. and freshened; jibed ship. 4 A. M. barometer, 29.35; air, 51°; water, 51°; a strong breeze and overcast weather; a bank of clouds to the westward. 6 A. M. set in thick with misty rain. During the morning, passed several pieces of kelp of various kinds; some like bunches of comb-grass[?]; some round-leaved; some like long round stalks. Ends with a strong breeze and overcast, misty weather; barometer, 29.21; air, 52°; water, 51°.

Jan. 27. Commences with a strong breeze and misty rain. 3 P. M. the wind hauled more west, moderated, and cleared off the mist. 4 P. M. barometer, 29.23; air, 52°; water, 50°. 8 P. M. barometer, 29.30; air, 51°; water, 50°. Midnight, strong breezes and cloudy weather. 4 A. M. barometer, 29.25; air, 51°; water, 51°. 6 A. M. spoke British barque Stanley, of and from London, November 1, bound to New Zealand. Ends with a strong breeze; clear overhead; some light smoky clouds to the westward; barometer, 29.36; air, 55°; water, 51°.

Jan. 28. Commences with a strong breeze and slightly smoky weather. 4 P. M. barometer, 29.38; air, 54°; water, 53°. 8 P. M. barometer, 29.40; air, 52°; water, 53°; a strong breeze, and lightly overcast weather; wind inclining to the northward. Midnight, strong breeze and cloudy weather. 4 A. M. more moderate; set all sail; barometer, 29.50; air, 53°; water, 53°. Ends with a strong breeze and slightly smoky weather; barometer, 29.57; air, 57°; water, 54°.

Jan. 29. Commences with moderate breeze and slightly hazy weather; a bank of clouds to the westward. 4 P. M. barometer, 29.54; air, 56°; water, 54°. 6 P. M. wind flawy and hauling to the westward. 7 P. M. saw some porpoises. 8 P. M. barometer, 29.52; air, 56°; water, 54°. Midnight, a fresh gale and rainy; double-reefed the topsails. 4 A. M. gale increasing; barometer, 29.30; air, 56°; water, 55°. At

8 A. M. more moderate, with a heavy bank of clouds to the westward. Ends with a strong breeze, and partially overcast; made sail; sea smooth; barometer, 29.22; air, 59°; water, 54°.

Jan. 30. Commences with a strong breeze and overcast weather. 2 P. M. commenced raining; wind squally. At 3 P. M. in a hard squall with rain, wind hauled suddenly to S. W., and finally settled at W. by N., with a strong breeze and cloudy weather. 4 P. M. barometer, 29.25; air, 56°; water, 56°; considerable head sea. 8 P. M. barometer, 29.25; air, 56°; water, 56°; cloudy threatening weather; lightning to the eastward. Midnight, strong breeze and passing clouds; head sea. 4 A. M. barometer, 29.40; air, 57°; water, 58°. 6 A. M. more moderate; made all sail. 8 A. M. water, 62°; 9, 62°; 10, 62°; 11, 61°; 12, 60°. Ends with a light wind and fine weather; some very light cirro-stratus clouds to the eastward; barometer, 29.54; air, 60°.

Jan. 31. Commences with a light wind and clear weather. 1 P. M. wind backing to the northward; braced sharp on a wind; passing several bunches and pieces of kelp. Water, at 1, 62°; 2, 63°; 3, 63°; 4, 63°; 5, 60°; 6, 60°; 7, 60°. 4 P. M. breeze freshening and blowing in puffs. 8 P.M. barometer, 29.40; air, 60°; water, 60°; blowing hard in gusts; furled all the light sails, and double-reefed the topsails; wore to the N. W. 11 P. M. wind gusty with light smoky clouds, and hauling back to N. W.; wore to N. N. E. Midnight, a fresh gale and cloudy. 4 A. M. barometer, 29.22; air, 60°; water, 60°; a strong gale and lightly overcast. 6 A. M. gale increasing, with a heavy sea. Ends with a moderating gale and highly overcast weather; a heavy bank of clouds to the southward; barometer, 29.25; air, 66°; water, 62°.

Feb. 1. Commences with a moderating breeze and overcast with smoky cirrus clouds. At 4 P. M. the wind hauled to the westward and cleared off; barometer, 29.26; air, 66°; water, 62°. At 6 P. M., after a hard squall, the wind hauled to S. S. W.; after which, barometer commenced rising fast. 8 P. M. squally with rain; barometer, 29.40; air, 60°; water, 62°. At 10 P. M. had a very heavy squall with rain. Midnight, a strong breeze and cloudy weather. 4 A. M. breeze moderating; barometer, 29.64; air, 60°; water, 63°. During the morning made all sail. Ends with a very light air and a few light clouds; barometer, 29.77; air, 62°; water, 64°.

Feb. 2. Commences with a light air and clear weather. 4 P. M. barometer, 29.80; air, 64°; water, 64°. 8 P. M. barometer, 29.80; air, 60°; water, 64°. Midnight, a light breeze and passing clouds; barometer, 29.84; air, 62°; water, 64°. Ends nearly calm, wind inclining to the northward; barometer, 29.84; air, 70°; water, 68°.

Feb. 3. Commences with a light air and fine weather. 4 P. M. tacked to the westward; barometer, 29.84; air, 68°; water, 68°. 8 P. M. clear; barometer, 29.84; air, 64°; water, 66°. Midnight, a fresh breeze and fine weather; tacked to the northward and eastward. 4 A. M. barometer, 29.80; air, 65°; water, 66°. 8 A. M. breeze dying away and baffling. Ends with a light wind and passing clouds; tacked to westward; barometer, 29.80; air, 74°; water, 69°.

Feb. 4. Commences with light airs and clear weather. 4 P. M. barometer, 29.74; air, 70°; water, 68°; light airs with a glim appearance to the westward. At sundown, a bad looking squall gathering to the southward; took in all the light sails. 7.30 P. M. took the wind from S. E.; moderate squall, scatter-

ing and leaving us with dark overcast weather; spits of rain. Midnight, a light wind, and dark rainy weather. 4 A. M. it fell flat calm, raining in torrents; barometer, 29.74; air, 67°; water, 69°; caught a light breeze from the S. W. and the weather began to clear off. Ends moderate and fine.

Feb. 5. Commences with a fresh breeze and passing clouds. Tried the water every hour: it stood regular at 69°, all the way in as far as I stood. Could see no indication of current. 4.30 P. M. made Perpendicular Cliff, bearing N. W. by W. 7.15 P. M. Perpendicular Cliff, S. S. W.; the Nipple, W. ½ N. Midnight, moderate and clear; shortened sail for daylight. 1.30 A. M. made Port Jackson light. Under easy sail till daylight. 5 A. M. passed the Heads and took a pilot from boat No. 4. Worked in and anchored. Ends with a fresh breeze and rain squalls. At 6.30 A. M. anchored in Port Jackson, south of Pinchgut Island.

When I was in England, two years ago, I expressed, before the merchants of Liverpool and London, the opinion that the average passage under canvas to Australia might be so shortened for ships from all north Atlantic ports as to make it a month less than the average by the old or admiralty route. Some of the ships in this trade, and especially some that sailed out of Liverpool, had already, under the advice of Mr. Towson, of that port, commenced to leave the admiralty route, and to go farther south in search of a shorter one; but what I proposed, was to find a route which, taking winds and distance both into the account, would give the shortest attainable average; and I urged that, all that was necessary for such an achievement was a better knowledge of the winds and currents by the way. And as for the passage home, that admitted of a still greater reduction on the average upon the admiralty route, which recommends vessels homeward bound to return, *via* the Cape of Good Hope instead of Cape Horn. The homeward route of the admiralty (*via* Cape of Good Hope) may now be considered to be practically abandoned, for I have not received the log-book of a single American vessel that has attempted it: they all come by the way of Cape Horn. And, in former editions of this work, the prediction was ventured that that part of the route, viz: from Australia to the meridian of the Cape, would, when it came to be rightly understood and properly followed, be made under canvas within 25 days. It has, during the last year, been accomplished in less time.

I asked the merchants, ship owners and masters, of England, for their co-operation to aid in the collection of the information requisite to the fulfilment of this promise; for their ships as they pass to and fro might "as well as not" make the preliminary observations by which we hope to be enabled to lift up, as it were, that land of gold and set it down, for all the purposes of commerce, one month nearer to the cities and marts of the realm than it had been. The people seemed to lend a favorable ear, and the government has promised a generous and hearty co-operation also.

Navigators have not yet made themselves fully acquainted with the new route, nor has there been time yet for them to do so, or for it to be generally adopted; but, even by a partial adoption only, the promise has been well nigh fulfilled. I have before me a list of vessels that arrived at Port Philip, from European and North American ports, between December 31, 1853, and July 7, 1854. This list was sent me by Captain A. D. Wood, of the Avondale, who, speaking of the vessels therein mentioned, says: "They were

taken from a file of papers in which some numbers were deficient; but, of the 362 vessels arrived up to the 7th July, inclusive, we have—

"40 vessels, or 11 per cent., who have made the passage in 90 days and less.

"80 vessels, or 22 per cent., including the 40 above, who have made the passage in 100 days and less.

"Average passage of the whole 362, 124 days (nearly).

"63 vessels, or 17.4 per cent., have taken 150 days and over.

"8 vessels, or 2.2 per cent., have taken 200 days and over (to 328).

"This is but a sorry picture of the state of navigation, and in many instances, I believe, the passages are understated. With proper attention to the Charts and Directions and Great Circle Sailing, the longest passage of the dullest sailer ought to be less than 150 days. While such ships as the Red Jacket, Guiding Star, &c., which profess to sail 17 to 18 knots, should now and then make it in 60 days.

"A. D. W."

Of these vessels, 236 were English, 41 American, 29 Dutch, and 8 French. About 10 per cent. of the whole are known to have had the Wind and Current Charts on board. But as it is not known that all of them took the new route, no attempt has been made to separate their passages from the rest. Were they to be separated, the average for the old or admiralty route would probably be a day or two greater than it is by this showing; but, taking them all, their average is in even numbers, 124 days. Now, referring to the table (*Crossings to Australia*), for those vessels that have either taken the new route, or attempted a middle course between that recommended by the admiralty and that recommended in the Sailing Directions, and taking the average of these passages so far, we find it 98 days, or 26 less than the other: thus fulfilling very nearly the conditions both of promise and prediction.

Both from America and Europe the sailing route to Australia, as far as the calms of Capricorn, is perfectly understood; for as far as those calms it is the route around Cape Horn, and it is the route also around the Cape of Good Hope.

The saving already effected for this part of the route from the United States is on the average ten days. With the assistance of navigators in the Australian trade, I hope to reduce still further the average of the passage, as it now is, for the vessels of all nations to that land of gold. A vast gain of time in that voyage is, in the end, to be made upon the admiralty route.

At the last meeting of the British Association, it was stated by a distinguished gentleman from Bombay that, where he came from, it was estimated that a set of charts and sailing directions for the Eastern Seas, based upon the principles of these, would produce an annual saving to British commerce that would be equivalent to a gain of $1,000,000 to $2,000,000 (£250,000 to £500,000).

At first, I thought this an over-estimate as to the saving they would effect, even for the whole world, in all parts of the ocean. I thought this, because I had never computed the rate per ton per day that shippers usually pay for freight across the high seas.

Between Europe and the United States, the average time both ways, from all ports, is about 40 days; and the average freight about $5 the ton, or twelve and a half cents per ton per day.

From the United States to Rio, the average time is about 45 days, at an average freight $8 the ton, which is at the rate of 17.7 cents the ton per day.

From the United States and Europe to Australia, the average passage without the Charts is 124 days, and the average freight about $25, or 20 cents the ton per day. With the Charts it is 98 days. To California, the freight ranges from $25 to $30 the ton, with an average passage of 133 days. This also gives an average rate of freight of from 18 to 22 cents per ton per day.

To be within the mark, let us assume the average rate of freight per ton per day, under canvas, on these distant voyages, to be 15 cents, and the average size of the vessels in that trade to be only 500 tons (it is really about 700).

The saving to be effected thereby, to vessels co-operating in this system of research, at 15 cents per ton per day for ten days, will be on the average at the rate of $750 for each vessel of 500 tons, whose passage these Charts may shorten.

Supposing, therefore, that 150 vessels only per month, or 1,800 per year of all flags, go from the ports of the North Atlantic Ocean to Australia, it appears that the amount to be saved here is even greater than the estimated amount for the Indian Ocean.

The United States alone, therefore, are not the only nation that is interested in the results of these investigations. All who use the sea are interested in them alike.

But the Secretary of the Navy, the Hon. J. C. Dobbin, has, on the part of the United States, with the view of enlisting the most extensive co-operation in this common plan for the common good, authorized all shipmasters that navigate the sea under friendly flags, to be placed upon the same footing, with regard to the Wind and Current Charts, which American shipmasters occupy. That is, any merchant captain, whatever be the flag he sails under, who will agree to keep and furnish an abstract log, of *every voyage*, according to the form prescribed at pp. 191–4, and on the terms set forth before the Brussels Conference, will be furnished therefor with a copy of these Sailing Directions, and of such sheets of the Charts as relate to his cruising ground.

Therefore, before applying for the Charts, each master should furnish himself with *at least* one good chronometer, one good sextant, two good steering compasses, a marine barometer, and three air and water thermometers, which barometers and which thermometers have been compared with recognized standards.

I say *at least*, because this is the smallest outfit of instruments that can enable the navigator properly to perform his part of the agreement.

The several foreign governments invited to co-operate in this system of research, have been requested to appoint each some person to receive these Charts, and distribute them to the shipmasters under the flag of his country, who are properly qualified and prepared to furnish, in the required form, the observations required.

It thus appears that navigators, who are invited to co-operate in this system, are not invited to labor

for naught. There is a prospect of direct pecuniary benefit to inure to every ship, the result of whose observations shall contribute to the shortening of the passage a single day; and that benefit is in saving, at the rate of $75 per day, for every day, on every voyage, that the passage of a vessel carrying 500 tons merchandise may be shortened.

A clipper ship, well handled, and with a good streak of luck in making the run from the United States into the variables of the southern hemisphere, will be able, now and then, to make the passage to Australia by this route in 60 days, if not in less time; but in 60 days it can be accomplished under canvas alone. It used to be a ten-months' voyage.

In that trade, clipper ships will be able to set up a strong opposition to steamers; for if we take into account the increased distance that steamers, touching at the Cape of Good Hope, and one or two other places, for coal, will have to go, together with the delays incident thereto, we shall see that our clipper ships have not much cause to fear that steamers will ever run them off the water in the Australian trade. Ships with steam, as an auxiliary only, may, if they go direct, drive clipper ships from that track.

As it has been already remarked, Australia and the United States are antipodal; they are 12,000 or 13,000 geographical miles apart, and it is about as near to come *via* Cape Horn, as it is to go *via* the Cape of Good Hope. The steamers, therefore, on their return *via* the Cape of Good Hope, have head winds to contend with for that much of the way; whereas, the canvas trader, returning by Cape Horn, has fair winds to go, and fair winds to come, from the Cape of Good Hope all the way east, even to Cape Horn.

The passage from Cape Horn to the United States is sometimes made in from forty to forty-five days; and Cape Horn may be reached under canvas from Port Philip, with these westerly winds and long swells, and by keeping well to the south, in twenty or twenty-five days.

I have great confidence in the existence, regularity, and force of these N. W. trades in the great Southern Ocean, especially on the polar side of 45° S.

The opinion may be rash, or the expression of it may seem like a boast; but, be what it may, I here repeat the prediction which I ventured some years ago, that the round voyage from the United States or England to Port Philip, and home again, can be made, and will be made, under canvas, by the route which these investigations will discover for us, in 130 or 135 days, or *less*.

Nay, I went further—for so great is the confidence I had in the richness of this field and in the propelling power of these westwardly trades of the extra-tropical south—and ventured the opinion that a voyage of circumnavigation could be accomplished by this route in less time than the passage has ever yet been made by clipper ships from New York or Boston to San Francisco.

All these predictions, except the one relating to the passage to the United States, have been fulfilled, and are now matters of history. They were ventured in a previous edition.

SHIP TAROLINTA, AT SEA, *Feb.* 5, 1854.

MY DEAR SIR: Finding it impossible to convey, within the limits of your form of "log," much beyond a record of position and direction of wind, I take the liberty of writing to you the following report, in further illustration of the voyage lately performed by the above ship, under my command.

It may be worthy of remark in this place, that I had a good chronometer (one of Dent's make), a sextant, the error of which was daily corrected, and that I endeavored to pay such attention to observations, astronomical and other, as I thought necessary to give worth to a report.

Sailing from New York, I adopted your book of Directions as a guide. Pursuing the route therein advised for the month of June, my ship crossed the line in long. 31° 30′ W.; thirty-six and a half days out.

With the wind from S. E., I stood on, keeping the port tacks aboard, waiting for a slant to head east on the starboard tack, besides being induced to proceed, without fear of Cape St. Roque, by the reports I had received of the absence of opposing currents, and of the advantages to be gained in the way of south-westerly breezes at night, along shore. In both respects I met with disappointment.

The fifth day from the "line" the wind hauled two points to the southward, blowing from S. S. E., or with the trend of the land abreast of our position. In the afternoon of the same day, the mouth of the Rio Grande bore west, distant about eight miles. Here the current became stronger, amounting to 2.5 knots per hour, as found by observation and confirmed by the reports of fishermen. I subsequently found, after a number of trials, that it seemed to have an inverse relation to the depth of the water. The weather grew much worse; the wind varying in force from moderate breezes to almost a calm, with frequent squalls coming from S. S.E. to S. W., of great force, and accompanied by heavy rain. Several times in the course of a watch, four or five changes would occur, from a light breeze to a stand-by-the-tops'l-halyards squall. Of these squalls—I think they were the blackest I ever saw. When enveloping the ship in mid-day, they would reduce the light so that you could not see an object more than 300 yards distant; they always approached in an arched form, with dim, grayish light underneath; the extremities of the arch near, or touching the water.

During the period of light winds, the ship of course was swept to leeward, requiring hard carrying in the squalls to recover lost ground. In the neighborhood of the Rio Grande the luminousness of the water, when disturbed, was strikingly beautiful. Looking under the counter, the keel could be distinctly seen by innumerable balls of light, of a reddish-yellow color, as large as a 32 lb. shot.

Between the 4th and 8th parallels of south latitude, we saw an unusual number of meteors, some of great brilliancy, the lesser ones emitting a white light, and appearing to be at the ordinary distance from the observer; the greater, a pale-green light, almost dazzling to behold, and in their flight, seeming remarkably near. Another peculiarity was the horizontal direction of their flight, and their leaving a train of glittering sparks not unlike those seen towards the middle of a rocket's ascension. In size, they were as large or larger than Jupiter, as he appears near the horizon. Whether these differences in what I have styled the greater and lesser meteors, were due to their respective distances, or to some cause connected with their production, must be a question of no inconsiderable interest.

At Rio, I had opportunities to learn the result of late passages from the United States. The opinion prevailing among the captains was that, at the same season of the year, the better course to pursue, when bound south across the "line," is straight from any point east of Bermudas, towards the longitude of crossing; and that, when headed off by adverse winds, to keep rap full down to 10° N., between which parallel and the "line" easting can be made with brisk south and S. S. W. winds. The shortest passage was made in 38 days, by a vessel pursuing such a route; the longest passage, in 76 days, by the old, not including a brig, 90 days from New Orleans.

Sailing from Rio, my purpose was to reach 50° S. as speedily as possible, without inclining much to the eastward, leaving it a question for future determination whether to go south of that parallel or not; but meeting with heavy weather and deep, trying seas soon after leaving port, my ship began to complain a great deal, many of her fastenings working more than was pleasant with so long a run before her; and what was most vexatious, the bolting of the rudder, as far down as could be seen, was gone, the pieces forming it apparently but slightly held together, and playing from side to side as every swell touched it; besides having a wounded bowsprit, I was deterred from going far south, lest I should involve the ship in pack ice.

It was no fair weather track we sailed along—a clear stretch of 7000 miles, with heavy gales and topping seas urging us on. But it would be a glorious one for a 1500 ton racer to spread her canvas on. It is the water for making great day's runs—for Yankee clippers to astonish the commercial world with reports of extraordinary speed. I have never sailed in any part of the ocean where the winds were so constantly strong and fair for running east.

I found that the gales in this Southern Ocean are similar to those of the North Atlantic in their changes, with reference to the equator, and are attended with like changes in the barometric column. A gale beginning at N. E. is attended by misty or drizzling weather, and a falling barometer; veering to N. W., the weather improves, the barometer becoming nearly stationary; reaching W., the wind falls light, with a clearing sky, the barometer rising slowly. Soon after this, it settles in the S. W., blowing a steady gale, the barometer now rising faster than it fell in the beginning. I can but give, in general terms, the results of my observations upon that very useful instrument, the marine barometer, in connection with winds and weather, lest I carry my report to too great a length.

With southeasterly gales, attended with drizzle, the barometer rises slowly until it reaches a height somewhere about 30.25; then the wind may be expected to haul to the N. E. Never but once, up to the present time, have I known a wind springing up in the S. E. to back into the S. W.

At N. E., the gale continues with the same force and weather, barometer falling in the same ratio that it rose until it reaches 29.75, or near it; then the wind passes the north point, blowing heaviest at N. N. W. (the barometer stationary), a sort of last effort, continuing only an hour or two. After this, hauls to W., barometer rising slowly; soon getting south of W., it becomes heavy, barometer rising rapidly.

South of the 40th degree of latitude, with the barometer stationary at about 30.00, and the wind

freshening in the N. W., with drizzling weather, a strong gale from the north will almost invariably come up in a few hours, accompanied by thick weather and heavy squalls, the barometer falling rapidly.

It will probably last until the barometer reaches 29.00, or $\frac{1}{10}$ lower, when it will haul, moderating suddenly, to W. N. W., with clearing weather. After the lapse of a few hours, it will haul into the S. W., and blow up heavy, the barometer rising faster than it fell, with fine weather, except an occasional snow or hail squall. I find that, generally, after the barometer has attained a height of 29.75, the S. W. wind becomes light, and backs into the N. W., freshens up, and repeats.

But if the wind holds in the N. W., moderate and pleasant, the barometer falling slowly, it may continue for several days; after which it hauls to the S. W., and blows a fresh and steady breeze, with clear weather, the barometer slowly rising. If the barometer does not rise when the wind has passed south of west, or, perhaps, continues to fall a little, the wind also becoming light and unsteady, look out for a heavy squall from the south.

These southerly squalls approach so suddenly that, at the same time you feel the southwesterly air, you see the water foaming under the squall's advancing front, not more than a few hundred yards distant. Their violence, short of a tornado, cannot be overrated; they are charged with snow and hail, and reduce the temperature to 22°; the barometer rising. After a few hours, the weather moderates and clears, the wind backing into N. W. If, however, the shift does not take place in a squall, but begins blowing up at S. S. W., a heavy gale will follow from S. or S. S. E., with thick weather, lasting from 8 to 50 hours, then backing as before.

I found a falling barometer to be invariably attended with drizzling weather, and a rising one with clear weather; and its greatest fall occurred when the wind was a little east of north. Its greatest rise is always with the wind S. W.

The sea rises and falls, operated upon by the various winds, with great rapidity; also showing a facility in accommodating itself to any new direction that is remarkable. In the log I send you, you will find the results of some estimates I made upon the height of waves, their velocity, and the distance between their crests. I took observations upon the largest only, repeating them often enough to give a good approximate idea.

From longitude 66° E. to 104° E., on or about the 47th parallel, the water had a dirty, shoal appearance, like that on soundings inside of the Gulf Stream along our own coast. The swell ran in parallel lines somewhat like the beginning of a breaker. The dense fog that prevailed most of the time, I thought, went far to account for so strange an appearance; but, as the same was observed when the atmosphere was clear, I was at a loss to reconcile it without the existence of a bank of soundings. I did not have the lead cast more than once, because the wind was strong and fair, rendering it difficult to do so to any purpose without much loss of time. And then, though the ship was luffed to, no satisfactory result was obtained, her drift being too great. After arriving in Port Philip, I learned from several captains that they had observed a similar discoloration. Comparing the information thus received, I found it extended over a surface of

ocean lying in a southeasterly direction, say from lat. 41° S. long. 40° E. to lat. 54°, long. 120° E.; the direction of a current you will find in the log.

I consider the display of lightning on the 20th October last so remarkable, that I make the following lengthy extract from my journal:—

"First part, light airs from N. N. W. and calms; weather cloudy; barometer falling slowly. Middle part, light variable airs and clear; barometer still falling. Latter part, variable airs and calms; weather in the N. W. dark and threatening, with an occasional flash of lightning, until 8 P. M. when the breeze settled in that quarter; barometer falling fast; furled topgallant sails, jib, and spanker. At 9, calm; lightning more vivid, with loud claps of thunder; hauled up the courses and double-reefed the topsails, expecting a heavy burst. Large ship in sight heading S. E. with her topsail-yards on the cap. At 10 P. M. a breeze springing up in the N. W. accompanied by heavy rain, thunder, and lightning; the ship enveloped in pitchy darkness, illuminated by bright flashes every few seconds; after each flash the atmosphere filled with cones of light, darting about in every direction along the yards and rigging, frequently passing within arm's length, much to the astonishment of the men on deck. Corposants on the mast-heads and yard-arms. The lightning preceding the severest claps of thunder seeming to pass between the masts, close to the deck, in a horizontal direction; barometer now at a stand; temperature of the atmosphere 2° higher; no change in that of the water. Midnight, light breezes from the N. W. and overcast; ship under all plain sail."

The entrance into Port Philip is exceedingly narrow, being only one and a half miles wide; its bottom is composed of a ridge of angular rocks, giving very irregular soundings; directly within or without the depth increases, over mud or sand.

It may readily be imagined with what velocity the tide must run through such an entrance, to elevate or depress the surface of so large a bay three feet. This rapid tide, mounting up and seeking its way across the rocky bottom of the entrance, produces, in the smoothest weather, a whirling and boiling at the surface; and, when opposed by a stiff breeze, heavy breakers arise and extend across the entrance, creating so much noise and confusion as might easily alarm a stranger, if he came without a proper knowledge of it.

My ship, when between the Heads with a stiff breeze, became for a few minutes totally unmanageable, slewing round against both helm and sails. The limits of the reefs extending from the Heads cannot be distinguished by any difference in the appearance of the breakers.

A rock with only 11 feet of water over it has lately been discovered, by several vessels being wrecked upon it, dangerously situated near the extremity of the reef off Point Nepean. I send you a clip from a paper, defining its position. Pilots paid by government begin to show themselves outside the Heads.

However, a stranger need have no fear of the entrance provided the breeze is commanding and fair, and he steers in according to the directions of the Admiralty's Charts.

Good anchorage is found all about the bay in from ten to fifteen fathoms, on a bottom of blue mud, so tenacious that ships frequently break their windlasses in attempts to purchase their anchors.

All vessels with cargoes for Melbourne anchor in Hobson's Bay, where those of more than 8 feet draught discharge into lighters, the latter ascending the Yarra-Yarra (flowing, flowing) River, seven miles, to the city.

Great improvements for commerce are in contemplation, land being obtained for the purpose of constructing wharves and docks. A railroad is also being built to connect these wharves with the city, and pipes being laid for the conveyance of water from the Yarra Dam, near the city, to the beach, to supply the shipping.

The distance from the thriving village of Sandridge, on the beach, to Melbourne, is two miles and a half.

The winds in Hobson's Bay prevail from S. S. E. to S. W. Once or twice each week a light morning breeze blows out, enabling vessels to get outside of the fleet.

Some five or six times during our stay we had strong northerly winds lasting from twelve to forty-eight hours, and succeeded by the usual winds coming up in a fresh squall.

The atmosphere, during the continuance of these northerly winds, is hot and dry, a peculiarity not to be wondered at when we consider the aridity of the interior. It is also charged with dust to that degree that a dense yellow fog seems to prevail. This dust is borne to the opposite shore of the bay (60 miles).

The shortest passage from the United States, was 80 days; the longest, 140. The shortest passage from Great Britain, 80 (by the Sovereign of the Seas).*

I have not time to send by this mail anything in reference to the passage from Melbourne to this place, farther than what is contained in this log.

Your obedient servant,

S. P. GRIFFIN.

CALLAO, *February* 11, 1854.

LIEUT. M. F. MAURY, U. S. N.,

Washington.

FROM AUSTRALIA TO CALLAO.

The Chincha Islands, with their guano, offer a return cargo both to Australia and California traders. The way from the former is plain, for the navigator has fair winds and flowing sheets all the way.

This route to Callao is the same as the route to Cape Horn, until it passes south of 50°. The distance from Port Philip to Callao is 7,000 miles, and the run has been made in 34 days. The *rules of the road* are simple.

From Melbourne make the best of your way for the intersection of the meridian of 170° E. with the parallel of 50° S. Then follow this parallel to its intersection with 120° W. Arrived here, haul up for your port, taking care when you arrive at the belt of light winds which border the S. E. trades, to steer due north until you clear them and get the trades, keeping your port to the northward of N. E.

* I am speaking of the time my ship lay in Hobson's Bay.

Abstract Log of the Barque Gem of the Sea (A. BOWEN). *From Port Philip to Callao.*

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Bar.	Temp. of air at 9 A. M.	WINDS. First part.	WINDS. Middle part.	WINDS. Latter part.
1853								
Sept. 25	38° 30′ S.	144° 45′ W.	E. N. E. 1 mile	30.0	54°	S. W.	S. W.	S. W.
26	39 36	146 45	E. ½ mile	29.9	54	S. W.	S. W.	N. E.
27	40 02	148 30		29.5	55	N. E.	North	N. by W.
28	42 00	152 45		29.3	53	N. W.	West	W. by S.
29	44 10	156 44		29.0	50	W. by S.	W. by S.	W. by S.
30	46 40	160 10		29.5	50	W. by S.	W. S. W.	W. by S.
Oct. 1	48 56	164 10		29.5	52	W. N. W.	W. N. W.	W. by N.
2	49 06 D. R.	168 10		29.6	54	W. N. W.	W. N. W.	W. N. W.
3	50 32 D. R.	173 20		29.8	54	W. N. W.	N. W. by N.	N. W. by N.
4	50 30 D. R.	178 20		29.8	52	N. N. W.	N. N. W.	N. by W.
5	50 28	177 00		29.9	53	N. by W.	N. by W.	N. by E.
6	50 19	168 00		30.0	53	North	North	N. W. by W.
7	50 16	162 00		29.7	52	N. N. W.	N. W.	West
8	50 20	157 00		29.6	52	N. W. by W.	W. N. W.	N. N. W.
9	50 24	152 00		29.3	52	N. W. by W.	N. N. W.	N. by W.
10	50 20	146 07		29.0	52	N. N. W.	N. by W.	N. by W.
11	49 09	140 20		28.4	50	N. by W.	N. by W.	W. S. W.
12	47 22	137 20		28.4	50	N. by W.	W. N. W.	N. W.
13	45 50	131 00		29.0	52	W. S. W.	W. S. W.	N. W.
14	44 35	125 15		29.3	53	N. W.	N. W.	N. W. by N.
15	43 07	119 15		29.4	54	N. W. by W.	N. W.	W. N. W.
16	40 44	115 50		29.1	54	W. N. W.	W. N. W.	W. S. W.
17	38 10	111 10		29.4	54	W. S. W.	W. S. W.	S. W. by S.
18	35 58	106 50		29.6	56	W. S. W.	S. W. by S.	W. by S.
19	34 29	103 13		29.8	58	W. S. W.	W. S. W.	N. N. W.
20	33 02	99 58		29.8	58	W. by S.	W. N. W.	N. by W.
21	31 28	95 50		30.0	60	N. N. W.	North	N. by W.
22	29 48	92 50		30.0	68	N. by W.	N. by W.	North
23	28 47	90 50		30.0	70	N. by W.	North	N. N. E.
24	26 05	91 25	Obs. 90 15	30.0	72	North	N. by E.	N. E.
25	25 34	No obs.		30.0	73	N. W.	E. N. E.	Calm
26	25 05	90 10		30.0	76	Calm	N. W.	N. N. W.
27	23 34	87 30		30.0	72	N. W.	N. N. W.	N. by W.
28	21 20	84 50		29.9	68	N. W. by N.	N. N. W.	N. W.
29	19 17	83 00		29.8	66	N. by W.	N. W.	
30	17 37	81 37		29.8	66	N. N. W.	S. E. by E.	
31	15 00	79 50		29.08	66	S. E.	East	
Nov. 1	12 30	78 00		29.8	66	E. N. E.		

Sept. 25. At 9 A. M. got under way off Shortland Bluff, and passed out through the Heads; at 10, with a 6 knot current setting out between the heads, the tide rip had the appearance of breakers, so much so, that a stranger would not have ventured. Knocked away the head rail and parted the larboard chain bowsprit shroud.

Sept. 26. At 6 A. M. made Wilson Promontory bearing E. N. E.; at 9, saw Curtis Island; passed it at 12.

Sept. 27. At 1 P. M. saw Kent's group; passed them at 8, and cleared the Endeavor reef at 11. This carries us clear of Bass's Straits out into the Pacific Ocean.

Sept. 28. Strong wind, with very heavy squalls of rain and hail, thunder and lightning.

Sept. 29. Strong gales, with heavy squalls of hail and rain. Lightning.

Sept. 30. Fresh breezes and pleasant weather. All sail set. Moderate breezes with fog and rain.

I find the marine barometer, in high south latitudes, to fall very low, as you will see, to 28.04, and that without any material change of weather for some time. I have noticed this some years previous to this, and, in the year '49, I have had it as low as 28.2 to the south of Cape Horn without any bad weather at all; but, as a general thing, the bad weather comes on as the barometer rises, and I have invariably had the heaviest part of a S. W. gale, with the barometer at 29.08; and I think you will seldom, if ever, get a heavy gale to the south of 48° or 50° S., with the glass as low as 28.5. You will have strong breezes with cloudy and rainy weather.

N. B.—The Gem of the Sea has made the quickest passage ever made from Port Philip to this place.

Yours truly,

CALLAO, *November* 25, 1853. A. BOWEN.

ROUTE FROM AUSTRALIA AROUND CAPE HORN.

The homeward route recommended in the 4th edition of the *Australia Directory* of the Admiralty, already referred to, and published in 1853, from Australia, is thus described at page 4:—

"Ships bound from Sydney to Europe or Hindostan, from the 1st of September to the 1st of April, may proceed by the southern route through Bass Strait, or round Tasmania, easterly winds being found to prevail along the south coast of Australia at that season, particularly in January, February, and March, when ships have made good passages to the westward, by keeping to the northward of 40° S., and have passed round Cape Leeuwin into the S. E. trade-wind, which is then found to extend farther south than during the winter months. In adopting the southern route, advantage must be taken of every favorable change of the wind, in order to make westing; and it is advisable not to approach too near the land, on account of S. W. gales, which are often experienced even in summer, and the contrary currents, which run strongest in with the land. The prevalence of strong westerly gales renders the southern route very difficult, and, indeed, generally impracticable in the winter, although the passage has been performed at that season, by ships in good condition, which sailed well; but the northern route, through Torres Strait, is preferred in the winter months."

Here is a difference as wide as the poles, and as far as the east is from the west. These Sailing

Directions which I am now writing are founded on, in fact they are the results of, the actual experience of navigators, and yet so great is the difference between them and the British Admiralty, the highest authority known in navigation.

They recommend vessels bound to Europe or America, from Sydney, to steer to the southward. The Admiralty Directory says, go north.

They advise vessels to go through Cook's Strait, or pass south altogether of New Zealand. The Directory of the Admiralty says, go north of New Holland, and pass through Torres Strait.

They say, come east. The Admiralty says, go west.

The same "brave west winds" which take vessels so rapidly from the meridian of the Cape of Good Hope eastwardly, along the parallels of 50° to 60° towards Australia, will also bring them over eastwardly along the same parallels towards Cape Horn.

The investigations which have been carried on at this office, concerning the winds of that part of the ocean, forbid me to recommend this Admiralty route to any homeward bound European or American vessel, under any circumstances whatever; always assuming that these Directions are intended for ships that are seaworthy, properly fitted and found. The average passage to Europe, by this admiralty route, is 120 days. Ships may occasionally find the easterly winds as low down south as the directions of the admiralty suggest: but it is the exception, not the rule, so to find them. In proof of this, I refer to the Pilot Charts of that part of the ocean, and shall quote other authorities.

To establish this point, I take the first abstract that I lay my hands upon. That happens to be the Thomas Arbuthnot's—an English trader—from Sydney to London, *via* Cape Horn.

Abstract Log of the Thomas Arbuthnot (G. H. Heaton). *Sydney to London*, 1849.

Date.	Latitude at noon.	Longitude at noon.	Bar.	Ther. 9 A. M. Air.	Ther. 9 A. M. Water.	Winds.	Remarks.
April 23	41°07′ S.	179°54′ E.	29.95	64°	62°	East	Variable and clear.
24	44 10	177 31 W.	29.60	62	59	E. by N.	Moderate and clear.
25	46 27	173 55	30.00	61	58	E. to N.	Strong breezes and heavy rain.
26	47 42	171 24	30.10	58	54	N. to N. N. W.	Strong breezes and heavy rain.
27	49 04	171 04	30.20	58	56	East	Moderate and clear, a heavy swell.
28	50 01	166 14	30.08	58	54	N. E. to N. W.	Steady, strong breezes, and clear.
29	50 14	160 40	29.70	55	53	W. N. W.	Steady, strong breezes, and clear.
30	50 32	154 59	29.70	54	52	West	Steady, strong breezes, and clear.
May 1	50 49	150 22	29.80	53	51	West	Steady, strong breezes, and very cold.
2	50 47	145 02	29.70	54	49	West	Steady, strong breezes, and very cold.
3	51 24	139 48	29.60	53	48	West	Steady, hard gales, and very cold.
4	52 04	134 30	29.70	52	47	West	Steady, hard gales, and very cold.
5	52 19	128 35	29.75	50	46	West	Hard gales, very cold.
6	52 48	123 32	29.70	50	44	West	Hard gales, very cold.
7	53 11	117 50	30.05	50	44	N. W. to W.	Hard gales, very cold, hazy, and damp.
8	53 40	112 48	30.08	50	44	W. S. W. to S. W.	Hard gales, very cold, hazy, and damp.
9	54 09	106 37	29.50	50	44	S. W.	Hard gales, much sea, much snow.
10	54 33	101 34	29.35	50	44	S. W. to W.	Moderate breezes and clear.
11	56 06	96 23	29.50	45	44	S. W. to S.	Freshening gales, with a high sea.
12	55 21	92 06	29.20	43	40	S. S. E. to W.	First part hard gales; ends moderating.
13	56 24	86 38	29.22	44	43	West	Steady, strong winds, heavy squalls, and rainy.
14	56 40	80 24	29.50	44	42	West	Steady, strong winds, heavy snow, and rain.
15	56 40	75 27	29.48	46	48	S. W. to S. S. E.	Variable, with light rain; ends increasing, snow.
16	56 52	69 10	29.35	40	40	South	Very heavy squalls, high sea.
17	56 52	65 20	29.17	42	38	S. W. to S. S. E.	Very heavy squalls; 2 P. M. saw Diego Ramirez Island.
18	55 05	60 19	29.50	43	40	S. E. to N. W.	Heavy gales, with lots of snow.
19	53 21	55 24	29.35	42	42	S. W. to S.	Heavy breezes, continual snow squalls.
20	51 15	51 17	29.50	42	42	S. E. to S.	Heavy breezes, continual snow squalls.
21	49 57	48 23	26.48	44	42	S. W. to S.	Moderate and clear.

Now this is not a very fast ship, yet in forty days from Sydney she had doubled Cape Horn.

She did not get into those "brave winds" until April 27, lat. 49° S. From that time till May 17, when she was off the Horn, she ran with flowing sheets through these free winds of the west, 106° of longitude in 20 days, which gives her the average rate of 5° 18′, say 200 miles per day.

The barque Gem of the Sea (A. Bower), which took the admiralty route to Australia, and missed the strength of these westerly winds, resolved to avail herself of them from Port Philip to Callao. She accordingly followed very nearly the great circle route, reaching the parallel of 50° south, in about longitude 169° east, and not recrossing it until 140° west (9 days). She arrived at Callao, November 1, 1853, after a very quick run of 37 days from Port Philip. Steam could not have done much better. She had westerly winds all the way, until she reached the parallel of 19° S., longitude 83° W. It is unusual, however, to carry these westerly winds so far up into the region of S. E. trades.

Again, the distance home from Australia is very much the same by Cape Horn as it is by the Cape of Good Hope.

It is obvious, therefore, that a vessel, running before these west winds, to Cape Horn, takes a route home, which, as to time—the true measure of distance—is much nearer than it would be to steer west in the face of these winds. But the Admiralty Directory recommends the navigator, it may be said, to go north, to get out of the region of these west winds; to go where the winds are easterly, and then steer west.

In reply, it may be remarked that, by going towards the equator, you go away from the great circle, where the degrees are short, and the distance shortest, into parallels where the degrees are long, and the distance greatest; and then the easterly winds are not, for speed, equal to those of the "bonny west," farther south.

These winds are already beginning to be known so well to the Australian traders, that it is usual for them, I am told, when bound home by this route, to strike topgallant-masts, before leaving port. It is a voyage that tries ship and crew; but of all the voyages in the world, that part of it between the offings of Australia and Cape Horn is perhaps the most speedy for canvas.

There it may outrun steam.

I have deemed it proper thus to allude to what I consider faulty *Sailing Directions*, because that *Directory* is uttered by the highest authority known to navigators; and because it was necessary to point out wherefore, and wherein, I differ, that navigators may then be enabled the better to choose, each for himself, which of the two to follow. And I may add, that I have not yet heard of a single homeward bound vessel taking the admiralty route from Australia. Certainly, none who are co-operating with me, have returned an abstract log for that voyage.

FROM AUSTRALIA TO CHINA.

Vessels bound from the southern ports of Australia, in the season from September to April, may go west of New Holland; but at other seasons, and from Sydney and the east coast, it is better to go east.

Observations are very much wanted in all these parts of the sea, and owing to the want of them, I am not prepared to issue any sailing directions for the various routes to and fro across the Indian Ocean, and its neighboring seas. I can only venture a suggestion here and there, which I hope will be regarded by navigators merely as suggestions for their consideration. Being in the dark as to the peculiarities of the winds and currents, the following abstract log will perhaps afford navigators more and better light as to this route, and its winds, during the season when it was made, than they would be likely to derive from any information that it is in my power to give.

Abstract Log of the Ship Queen of the East (TRUMAN BARTLETT). *From Sydney to Hong-Kong.*

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Bar.	Ther. 9 A. M. Air.	Ther. 9 A. M. Water.	Winds. First part.	Winds. Middle part.	Winds. Latter part.
1854									
April 1	33° 10′S.	156° 20′ E.		30.3	68°	74°	S. W.	S. S. W.	South
2	32 37	160 34		30.2½	68	75½	South	S. S. E.	S. E.
3	30 32	163 52		30.3	69	75	S. E. by E.	S. E. by E.	S. E. by E.
4	28 52	165 51		30.3	69	75	E. S. E.	E. S. E.	E. S. E.
5	27 16	167 12		30.3	71	76	E. S. E.	E. S. E.	E. S. E.
6	25 20	168 40		30.1½	72	76	E. by S.	East	E. by S.
7	23 22	169 30		30.0	77	78	E. by S.	E. by S.	E. by S.
8	21 23	170 56		29.8½	78	78	E. by S.	East	East
9	17 28	171 12		29.7	83	82	E. by S.	E. S. E.	E. by S.
10	13 33	170 58	36 miles, W.	29.6½	85	85½	E. by S.	E. by S.	E. by S.
11	10 44	170 40	24, W.	29.6	88	86½	E. by S.	East	East
12	9 14	169 57		29.6	88	87½	E. N. E.	E. by S.	N. E. by E.
13	6 44	168 45		29.6	87	88	N. E. by E.	N. E. by E.	N. E. by E.
14	5 00	167 00	15, W.	29.5	86	88	N. E.	N. E. by E.	N. E. by E.
15	4 04	165 40	24, W.	29.6	87	89	E. N. E.	E. S. E.	E. S. E.
16	3 10	164 40		29.4	87	88	E. N. E.	E. S. E.	S. E.
17	2 28	164 30		29.5	88	90	N. E.	East	S. E.
18	1 14	163 00	18, W.	29.6	87	89½	S. E.	East	N. E.
19	0 32	162 33		29.6	90	89	Variable	Variable	Variable
20	0 19N.	161 45	20, W.	29.5	86	89½	East	E. N. E.	N. E.
21	0 55	161 20		29.5	88	90	Calm	Calm	N. E.
22	1 08	160 58		29.5	88	89½	N. E.	Calm	Calm
23	1 32	160 55		29.6½	87	89	N. E.	N. W.	N. E.
24	3 32	159 30		29.6½	81	88	N. E.	E. N. E.	E. N. E.
25	5 16	157 12		29.6	82	87½	N. E. by E.	N. E. by E.	N. E. by E.
26	8 06	155 00		29.7	84	86½	N. E. by E.	N. E.	N. E.
27	10 28	151 30	24, W. S. W.	29.7	83	85	N. E.	N. E.	N. E.
28	12 09	148 35	24, W. S. W.	29.7	82	85	N. E.	N. E.	N. E.
29	12 53	146 18		29.7	85	85	N. E.	N. E.	N. E.
30	13 04	144 50		29.7	86	85	N. E.	N. E.	N. E.
May 1	14 37	142 17	24, Westerly	29.7	86	85	N. E.	N. E.	N. E.
2	14 30	140 04	None	29.7	86	86	N. N. E.	E. N. E.	E. N. E.
3	15 30	138 03	12, Westerly	29.6	86	89	N. N. E.	N. N. E.	East
4	15 54	136 40	12, W. S. W.	29.6½	86	88	N. N. E.	East	E. S. E.
5	16 37	134 37	12, S. W. by W.	29.7	85	88	N. E.	N. E.	E. N. E.
6	17 37	132 28	Little, if any	29.7	85	87	East	S. E.	N. E.
7	18 13	131 07		29.8	86	86	N. E.	East	N. E.
8	18 25	129 13	24, E. S. E.	29.7	85	87	East	East	East
9	18 37	127 53	38, E. S. E.	29.7	86	88½	E. S. E.	East	E. S. E.
10	19 00	126 40	15, E. S. E.	29.7	87	86½	E. S. E.	S. E.	S. E.
11	19 43	125 10	None	29.7	86	85	S. E.	East	E. N. E.
12	20 00	123 41		29.6½	86	85	S. E.	S. E.	S. S. E.
13	20 10	120 30		29.7	85	88	S. S. E.	S. S. E.	S. S. E.
14	20 00	118 35		29.7	86	88	S. E.	S. E.	S. E.
15	20 24	115 54		29.7	86	87½	S. E.	East	East

Sailed from Sydney March 31, with a moderate S. W. wind. At noon, the Heads bore W. by S., 20 miles distant.

April 1. Throughout, fresh breeze, with passing clouds.

April 2. do. do. clear, fine weather; smooth sea.

April 3. do. do. frequent squalls of fine rain; tide rips.

April 4. do. do. with dry passing clouds.

April 5. do. strong breeze and squally; under single topsails.

April 6. do. do. fine rain; bad sea.

April 7. do. do. and passing clouds; all sails set.

April 8. do. do. squalls of wind and rain; reefed topsails.

April 9. do. do. all sails set.

April 10. do. do. do.

April 11. First part, a moderate breeze and clear weather; middle and latter parts, airs.

April 12. Throughout, a moderate breeze and clear weather.

April 13. do. do. do. water smooth and discolored.

April 14. do. do. do. do. do.

April 15. do. light breeze, and clear hot weather.

April 16. First part, a light breeze; at 2 P. M. a heavy bank rising from the E. S. E., a hard squall of wind and rain to the end of the day.

April 17. Throughout, light airs, and clear hot weather.

April 18. First and middle parts, much rain; latter part, clear weather.

April 19. Throughout, a light breeze all around the compass; passed over the place assigned to the Isle of Sharks; saw no appearance of land.

April 20. Light airs throughout, with squally appearances.

April 21. First and middle parts, calm; latter part, a light breeze, clear weather.

April 22. First part, a light air; middle and latter parts, calm, heavy rain squalls.

April 23. Throughout, light airs and rain squalls.

April 24. Throughout, dark, cloudy weather, with hard squalls of rain.

April 25. First part, a fresh breeze, and rain; latter part, clear weather.

April 26. Throughout, a good steady trade, and clear weather; at 2 P. M. saw the Seven Islands. I made the westernmost isle in lat. 5° 44′; long. 157° 22′ E.; passed over the location of Bordelaise; saw no appearance of land. I have since learned it does exist, but is laid down wrong.

April 27. Throughout, a moderate N. E. trade, with hard passing clouds.

April 28. Throughout, a moderate N. E. trade, with hard passing clouds.

April 29. Throughout, a light breeze and clear weather.

April 30. Throughout, a light breeze and hazy weather; at 6 A. M. saw the Island Guam W. N. W., 20 miles distant; at noon, the S. W. part of the island bore N. by W. 10′. This island appears to be laid

down correctly. The land is rather high, and can be seen in clear weather 50 miles. There are several low islands lying to the south and west of it, 4′ to 6′ distant, with reefs. It would not be safe in a dark night to run for the island between these bearings.

May 1. Throughout, a moderate breeze and clear weather; sea very smooth.

May 2. Throughout, light breeze and clear weather; sea very smooth.

May 3. Throughout, light breeze and clear weather; sea very smooth.

May 4. Throughout, light breeze and clear weather; sea very smooth.

May 5. First part, clear weather; middle and latter parts, rain and squally. Wind: light.

May 6. First part, squally weather; at 3 P. M. a heavy squall of wind, rain, thunder, and lightning; the first lightning I have seen since leaving Sydney.

May 7. First and middle parts, light airs and squally weather; latter part, clear weather.

May 8. Throughout, a light breeze and clear weather; sea smooth as a pond.

May 9. do. do. do.

May 10. do. do. do.

May 11. do. do. do.

May 12. do. do. do.

May 13. First part, a light breeze; middle and latter parts, a fine breeze with clear weather; at midnight, made Claro Babuyan, bearing W. 20 miles distant; at 3 A. M. Babuyan bore south, and the Bantling Rocks N. E. by N.

May 14. Throughout, moderate, clear, beautiful weather.

May 15. do. do. do.

May 16. Throughout, a moderate breeze and clear weather; at 6 A. M. made Great Leman Island bearing N. W.; at 11 A. M. anchored in Hong-Kong Harbor, 46 days from Sydney. Distance sailed, 6,137 miles.

TRUMAN BARTLETT.

HONG-KONG, *May* 20, 1854.

THE ROUTE TO INDIA.

The route from the North Atlantic to India, Java Head, the "Eastern passages," and all ports beyond, is the same as the route to Australia, at least until the calm belt of Capricorn in the South Atlantic be cleared, and thence frequently until the meridian of 40° E. be approached. Here the road forks and the Indiaman takes the left.

I have not yet received log-books enough from vessels cruising in the Indian Ocean, to justify a thorough discussion of the winds of that sea; but, after attentively considering the present route to India,

I think I may anticipate that discussion somewhat, for I perceive room for improvement, by which a day or two at least may be saved on that passage. In studying the routes of navigation out upon the high seas, nothing has surprised me more than the fidelity with which the pioneer voyagers have been followed. In olden times, he who had been the first to make any particular voyage, came back and told the way he went; he could speak of no other, for he knew of none; then came the follower, who naturally would go the same way; and finally tradition led to the establishment of highways by routes across the ocean which chance had pointed out. They were adopted in the directories of the ocean, and at last became in some instances so well established, that if a shipmaster ventured to depart from them, as therein laid down, he departed at his peril and at imminent risk. If, by the departure, he by chance should have a long passage, he ran the risk of being turned out of his ship by owners; and if accident befell him by the way, even though he should make a good passage, underwriters might have something to say about his being out of the *usual* route, and thus he was in danger of losing his insurance as well as his place.

More attempts seem, however, to have been made by navigators to find new routes to India and the East, than to almost any other land beyond the seas. There is what was called the eastern passage, which lies south of Australia; this now is seldom or never, and should be never, attempted, unless for very special reasons. Then there was the Boscawen Passage, the Middle Passage, the Inner Passage, the Passage to the Eastward of Madagascar; and to China, the routes through the various straits east of Sunda, and others which I need not describe nor discuss. I need not describe them, because they are fully described by Horsburgh, and are usually projected on the charts of those seas: and I need not discuss them, because I have not the data which would justify any discussion except one based upon mere general principles: I shall not, therefore, be able yet awhile to throw any light upon the routes to India or the East, after the voyager enters the monsoon region of the Indian Ocean. All that I feel myself justified at present in saying with regard to the route to India or China, applies to it before it enters those regions, and while it and the route to Java Head and the passages east, are for the most part the same.

I will address myself, therefore, for the present, only to that part of the route to Java Head which lies south of the calm belt of Capricorn, and which is included, for the most part, between the meridians of 20° or 30° W., and 80° or 90° E.

A vessel bound through the Straits of Sunda, after crossing the equator in the Atlantic, generally holds her wind, hauling up to the eastward, as the S. E. trades will allow, until she gets into the calm belt of Capricorn. Here, though she does not find long continued calms, she finds nevertheless those light winds which are always found to prevail in that sort of debatable ground, which is between two systems of winds: this calm belt is between the S. E. trades on one side, and the variables or "brave west winds," of the southern hemisphere on the other.

Having cleared the trades, she then edges off a little to the east of south until she gains the parallel of 35°–37°; crossing this, she hauls up due east, between the parallels of 37° and 39° and runs between them—the place of all others where the southern edge of the cyclones of those parallels is most apt to be felt adversely—from the prime meridian to long. 80°–85° E. Here she begins to head up to the north, and

crosses this calm belt in the Indian Ocean, again *obliquely*, which should never be done. These calm belts should always, whenever the land and dangers will admit, be crossed as directly on a meridian as the winds will allow; for the sooner you cross them, the sooner you will get winds that will drive you along.

Such is the course of the present route, which can be shortened at least a day or two by any vessel that will follow these directions:—

After crossing the parallel of St. Roque, stand through the S. E. trades with a rap full, as if you were bound to Australia, not caring to make better than a S. S. E. course good, until you lose the trades, clear the calms of Capricorn, and get the "brave west winds" on the polar side of them. If you follow these directions, you will generally clear the calms, and get these west winds by the time you reach lat. 30°–37°—finding yourself, at this juncture, somewhere between the meridians of 20° and 30° west. Now shape your course per great circle for the intersection of parallel of 35°, with the meridian of 85° E., or any other near which it may be deemed advisable, with the changing seasons, to enter the region of S. E. trades of the Indian Ocean.

The following route, from 30° W. 35° S. to the intersection of this parallel with 85° E., differs so little from the great circle that the difference becomes practically of no moment:—

Suppose you clear the calms of Capricorn in lat. 35°, long. 30° W., steer for the meridian of 10° E., at its intersection with the parallel of 50° south; then run on this parallel to long. 50° E. From this point steer for the intersection of 85° E., and 35° S. The distance to be run south of the parallel of 35° being 5,300 miles—the distance by the present route being 5,500—so here is one day's sail gained by the "short cut," and certainly better winds. But, suppose you have good luck in the South Atlantic, and can clear the calms of Capricorn in 20° W. instead of in 30° W., but in the same latitude, your course then is to aim to strike the parallel of 50° in 20° E., and then run along it as before to 50° E.; the distance south of 35°, by this route, being 4,900 miles.

But suppose the winds favor you still more, and you be in 10° W. before you reach the parallel of 35°. In this case, you should run between the parallels of 45°–46° till you come to the meridian of 50° E.; you should so shape your course from 10° W. as to get between these parallels, near the meridian of 20° east. The distance south of 35°, by this route, is 4,400 miles; in other words, the distance from the usual place of crossing the parallel of St. Roque to Java Head, is—

By present route	9,200 miles.
" 1st of the above	8,940 "
" 2d " "	8,730 "
" 3d " "	8,520 "

If the winds were fair all the way, the nearest route to Java Head, from the fair way off St. Roque, would be *via* the Cape of Good Hope; indeed, the great circle runs through the unexplored regions of Africa. But both the winds and the land render such a route in navigation impracticable; for the former generally compel the outward Indiaman, in spite of herself, to cross the meridian of 25° west, as far south as the parallel of 30°–33° S.; and the great circle thence to Java Head passes some 8° or 10° south of the

Cape of Good Hope. Moreover, the winds in the Indian Ocean render a departure from the great circle again necessary. The winds are such, however, as to admit of all four of the above named routes. The route No. 3 is 600 miles shorter, and has better winds than the present route. But, after clearing the S. E. trades of the Atlantic, it runs about 1,000 miles obliquely across the calms of Capricorn, where the average rate of sailing is not over 100 miles a day. Now, by going straight across these calms as by route 1st, you will clear them generally in two days, and then get those "brave west winds" which will waft you along at the rate of 200 or 300 miles a day, according to the heels of the ship.

The navigator, therefore, will act most wisely who will wait, and let things as he may find them govern him as to where, after passing the S. E. trades, he will begin to shape his course for the great circle to the meridian of 85° E., or that near which he proposes to cross the calms of Capricorn in the Indian Ocean. He may begin to do it anywhere south of 30°, and between the meridians of 30° and 10° W., and reach Java Head two or three days sooner, on the average, than he would by continuing to follow the present route.

In attempting to follow these great circle routes, navigators should recollect that the greatest saving of distance, as compared with the rhumb-line route, is always along those arcs that lie nearly east and west, and are farthest from the equator; and that, so far as distance is concerned, he might as well be out of his way on one side of these arcs, as the other. As illustrative of this route, I may refer to the track of the ship ———, with regard to which I will only say that, if she had stood on from lat. 28° to 35° (at that season), in long. 20° W., and then shaped her course per great-circle route, she would probably have done better; as it is, she crossed the meridians as follows:—

0°	in	36° 20′ S.
20° E.	"	38° 20′
40°	"	38° 35′
60°	"	38° 00′
70°	"	38° 20′
80°	"	36° 00′
90°	"	33° 00′

"Arriving in lat. 28° 00′ S., long. 22° 00′, I projected," says her master, "on my chart the great-circle course thence to Java Head, the vertex being in lat. 44° 00′ S., and long. about 25° 00′ E.; I adhered to this course as far as practicable, having in view the favorable sailing points of the vessel, and being compelled to run her before some of the heavy seas in the high latitudes, until reaching the parallel of 30° 00′ in long. about 69° 00′ E., when I deemed it prudent to keep to the eastward of the great circle course, and approach the meridian of Java Head farther south, to forelay for the chance of there being considerable easting in the trades. I crossed the tropic in about 94° 30′ E. long., and fetched Java Head sailing upon an easy bow-line (which is a good sailing point of the vessel, and, I believe, of most sharp vessels). I will remark here, that I could find nothing explicit in 'Horsburgh' regarding the direction of the wind in the S. E. trades; but, after many unsatisfactory remarks, the whole is summed up on page 161, vol. 1, 5th edition, thus: 'When

the sun has great north declination, it may not be absolutely requisite for ships which sail well to reach the meridian of their port so far southward, the trade-wind *then* blowing more from S. E. and E. S. E. in general than from E. and E. N. E.' Accompanying my abstract is an abstract of the log of the ship Minstrel, of Boston, which vessel (commanded by my brother), pursued the admiralty route in running up her easting; and, although he crossed the equator in the Atlantic 12 days before me, yet I made Java Head the day before him, and there was not much difference in the sailing of the vessels; where I gained on him most was in the high latitudes. Although I made a fair passage by pursuing the circle course so far as the lat. of 35° 00′, yet I would not again adhere to it further than the vertex; thence I would sail east, on or near that parallel, until reaching the longitude of 90° 00′ or thereabouts: then hauling north across the belt of variables to the southward of the trades, at right angles, and be upon the safe side after reaching the trades, at any season of the year. A good passage could perhaps be made by sailing on a circle course from the Atlantic to a good position, relative with Java Head, in the Indian Ocean, say 95° 00′ E., and 33° 00′ S.; but the vertex would be far south of 53° 00′, or thereabout. And I should not feel justified in attempting to pursue such a route until we have some definite information relative to the existence of danger from ice, against which 'Horsburgh' cautions navigators. Commodore Ringgold, in his route toward Australia, in the Vincennes, went, I think, as far as 48° 00′ S., and, I believe, saw no ice.

"With regard to the current we experienced in the China Sea, near the coast of Cochin China, I should think it almost unprecedented. On my last passage down, I had nothing of the kind. May it not have been a rush of water out of the Gulf of Siam, caused by the very heavy rain with which the S. W. monsoon was ushered in, and which were experienced in part by me on the passage up the sea? and would not observations of the thermometer and hydrometer have been valuable? There was an unusual quantity of rain in the early part of the monsoon. The current, in the east coast of China, is always running with more or less strength in the S. W. monsoon to the N. E. (unless disturbed by the passage of a cyclone). But I never experienced anything like the current we had off Cape Varela, which prolonged our passage so greatly. There was a typhoon in the southern part of the China Sea, in the month of May this year; also one last year in the same month. I have never known them so early in the northern part of the sea. I would say here that I think a series of observations of the barometer, thermometer attached, and the force of the wind in connection with each other in the Indian Ocean, in the hurricane months, would be of great value to the navigator sailing there at such times, and more especially those homeward bound from Java Head, in the S. E. trades, as any deviation from the mean height of the mercury would at once show some obstruction to the surface wind. The general course of storms about there is nearly W. S. W., I believe (or parallel with the course of a vessel bound round the cape), until, reaching the meridian of Bourbon, Mauritius, and sometimes Madagascar, they curve abruptly south. Now, a vessel near the southern or southwestern disc of a cyclone with the wind at S. E. or E., with strong breezes and squally weather, a low barometer, or lower than the mean range for these months, and anxious to make a quick passage (possibly racing), would, perhaps, be loth to heave to for a few hours and wait for a rise in the barometer; the storm advancing in the mean time (the average velocity of which is probably greater than that of a smart vessel), would get ahead of the ship, possibly, near its point of curvature, and the ship still going along would be

plunged headlong into the vortex in a very few hours. I hardly think it possible for even the smartest vessel to beat the storm and cross its path before it, and in time to be safe; under such circumstances, the best and only safe course would be, in my opinion, to heave to, *head to the southward*, as soon as the barometer indicated bad weather, and watch for its rise. I have the most entire faith in the indications of a barometer within the tropics. 'It marks the passage of a storm with the regularity of a clock,' says Mr. Piddington. As an instance of most admirable management under such circumstances as the above, a pamphlet, written by Capt. R. Methven, of the British ship Blenheim, is, I think, the best practical illustration that could be offered. In the China Sea, if bound northerly, it is probably safe to scud with the wind at S. W. if tolerably certain of your position. With the wind at north, the best course would be, I think, to run to the southward *in time* (say with the force of the wind at 7), *whether bound north or south;* if bound south, run out of it; and if bound north, run to the southward till the wind veers westerly, then round to upon the port tack, wait for the rise of the barometer, and go back again with the southerly wind near the rear verge of the storm; supposing, of course, the condition and position of the ship permitted it. With the wind at N. E., and no possibility of making a harbor, the only alternative, I think, would be to heave to, *under fore and aft canvas*, on the starboard tack, and prepare for the worst. The advance of the storm, I think, impels a body of water before it, causing a surface current to the westward, which it would be well to bear in mind."

Navigators, by taking the old route, are liable to meet with another difficulty, especially when they attempt to run down their longitude near the parallel of 35°–6° south. About this parallel is a famous place for circular storms—cyclones. They revolve with the sun, and the parallel of 35°–6° is frequently traversed by the southern edge of them. Consequently, as these storms travel east or west, the wind on the southern edge of them is generally from the eastward.

From Abstract Log of ship Lady Arabella (N. B. Grant, Captain).

Winds and Currents between Singapore and Batavia: On the afternoon of June 14, left Singapore for Batavia with a fine breeze from the westward, which carried us as far as the entrance of the Straits of Rhio, when it fell calm, with the tide setting out of the straits; was obliged to anchor. At 6 A. M. of the 15th, weighed with a light air from the southward, and fair tide into the straits. Had nothing but faint airs from the southward and calms, until the evening of the 17th, at which time we passed out of the strait with a fresh breeze from S. S. E. The tides we found to set through the straits to the northward at the rate of 3 to 4 knots per hour, for about 14 hours steady, followed by a "slack" of about 2 hours, when the set would turn to southward for about 6 hours, 2 to 3 knots, followed by another two hours "slack," and then would commence the strong northerly set again. Whether these are the usual tides of the straits I am unable to say; but, such I found them during the three days I was in getting through. On the 18th, had a heavy squall from N. W. with much rain, which lasted 4 hours. From that time until we reached the entrance of Mecclesfield Straits (on the 28th), we had the wind between S. by E. and S. by W. for nearly all the time. Rain and squalls, accompanied with thunder and lightning, were frequent; and one on the 26th, from S. W., blew heavy for two hours; but, for the most part, they were from the southward with but little wind.

While working down past Lirgin Island, close on shore, I found no current; but one day, taking the wind at S. S. W., I stood off 60 miles and found the current setting to the northward about 12 miles a day. On the 24th, off Palo Toty, being becalmed, found a southerly current of about one-half knot; and, on the 25th, with the N. E. part of Banca Island bearing S. E. 20 miles, found the current setting S. W. one mile per hour, wind S. S. E., but very light; but a brisk breeze springing up from south, tacked ship, and did not determine whether it was the effect of the tides or a regular current. In working down from the latitude of the north part of Banca to Guspas Straits, nearly in the longitude of Guspas Island, I had the winds very light and baffling, hauling from S. S. E. to S. S. W. and back, sometimes as often as three or four times an hour; at other times it would remain at south for four or five hours at a time, followed by a rain squall and intervals of calm. The current seemed to set due north about 14 miles per day. On the morning of the 28th, at 8 o'clock, the north end of Palo Leat bearing east 4 miles, with a fresh breeze from S. S. E., attempted to beat through Mecclesfield Straits; for the first two "tacks" we gained a little, and got as far along as Discovery Rock, on which the sea broke all day; and, although the wind freshened to as much as we could carry topgallant-sails to, yet at every tack after this we lost ground; and at 8 P. M., the wind falling off, anchored in 15 fathoms water, soft ground, about 5 miles west of where we were in the morning. After anchoring, found the current running due north 4 knots, and so continued until 6 A. M., 29th, when it slacked a little, but at no time was it less than 2½ knots. At 10 A. M. a breeze sprung up at S. by E., and, as the tide was gaining strength, weighed and stood over to eastward for Stobyn's Straits, fully convinced it was useless to attempt to beat through Mecclesfield at daylight. On the morning of the 30th, being in the north entrance of Clement's Straits, with the wind at east, stood to southward; and, although we had a strong current against us, yet as the wind freshened and held well to the eastward, we made rapid way to the southward, passed to eastward of Barn Island; but not being able to weather Saddle Island, kept away and passed through the narrow passage between the reefs off Barn Island and Low Island, into the south entrance of Mecclesfield Straits; and by dark, was clear off the south end of Vansittart's Shoals, with the wind light from S. E. From that time until July 4, instead of the fine S. E. breezes that I had heard so much of in the Java Sea at this time of the year, I found the same light baffling winds, mostly from S. by W., that so annoyed me in the China Sea. At noon, July 4, the North Watcher bearing W. S. W., and the Armayden Lands just visible from the deck, it died away to a "dead calm," and up to this time of writing, 10 P. M. of the 6th, it so continues; and, as the current is setting N. N. W. at the rate of ¾ knot per hour, we are at anchor in 11 fathoms of water, and whether we shall ever get to Batavia remains a question of some doubt.

Batavia, July 8, 1853. Arrived here last evening, after a passage of 23 days from Singapore, a distance which I accomplished with very light winds "going up" in 6 days, as will be seen by referring to the journal.

Oct. 14. Lat. 5° 55′ N.; long. 27° 32′ W. Baffling, faint airs; at 7 P. M. calm; lowered the boat and tried the current; used the deep sea line with a thirty pound lead attached for a weight; let it down 60 fathoms, and hove the log, which went off S. ½ E. by compass, ⅜ knot; raised the weight to 30 fathoms depth, and hove again; this time the log went south by compass, ½ knot per hour.

After coming on board, threw a bottle overboard with date, latitude, and longitude, requesting the finder to forward the paper to Lieut. Maury.

I am of the opinion there is an under current, setting northerly, somewhat below 20 fathoms, and that the surface current is very small, setting southeasterly.

Oct. 18. Lat. 8° 30′ N.; long. 28° 53′ W. Begins with a light air from S. E., with a large swell from N. E.; middle and latter parts, calm; lowered the boat and tried the current; used the same weight as that mentioned on the 14th; for a log line, I used light cotton twine that would float on the surface, attached to an ordinary log chip, loaded just to sinking, with a cork attached to prevent it from sinking more than a few inches under water. With the lead down to 50 fathoms, the chip moved off N. W. (mag.) at the rate of 50 feet per minute; at 60 fathoms depth, the chip went in the same direction 67 feet per minute. Raised the lead to 20 fathoms, and tried again. This time the chip went due west (mag.), but so slow as to be hardly perceptible (15 feet per minute). The difference between my position by reckoning and observation for the 24 hours, is 6 miles north and 3 miles west. I think the reckoning cannot be more than a mile wrong at most, it having been a dead calm for 17 hours out of the 24, and the breeze very light and steady for the other seven. My chronometer is a very accurate one, and I use a sextant for all solar observations. Hence, I infer an under current setting southeasterly, something more than 20 fathoms beneath the surface.

FROM CHINA AND JAPAN TO VALPARAISO.

The following letter, with such modifications as time has suggested, was written some months ago at the request of a merchant of Boston. One of his vessels is now on her way from Hong-Kong to Valparaiso with it as a guide. I have expanded it so as to comprehend the route from Shanghai and Japan also.

OBSERVATORY, WASHINGTON, *November* 24, 1854.

MY DEAR SIR: I have your favor of the 20th, telling me of the Nightingale's prowess, and asking for Sailing Directions from Hong-Kong to Valparaiso. I feel quite as proud of the Nightingale's achievements as you, her builder, or her captain can. I am committed in writing to have the round voyage to Australia and back made within 130–5 days. Now, your Flying Cloud has gone from New York to the line in 17 days or less, which, with the Nightingale's run from the line to Australia, would have made the run there in 62 days. I have *heard* of the run back to England being made in 63 days, thus establishing the possibility of a fulfilment to the prediction. The difference of time from Liverpool to the line, and from Boston to the line, is from four to five days. By the old route, the difference was about 1,000 miles; by the new route, Liverpool is about 300 miles nearer, with the advantage of free winds and flowing sheets through the trades, against head winds and a taut bowline from New York.

I shall be glad to have the Nightingale's log.

Now, for the Sailing Directions from Hong-Kong to Valparaiso in April.

I have been hunting up for you all my unfinished manuscripts, and other materials in the office, that are calculated to throw light upon the "lightning route" from Canton to Valparaiso in April. In preparing sailing directions for you for this voyage, I might as well consider Shanghai and Japan also.

Before we begin to discuss routes, let us look at distances, by air-lines first, water-lines next.

The distance, by an air-line, from Hong-Kong to Valparaiso, is about 10,000 miles. This line passes over New Holland from north to south, entering the sea near Port Philip. But Shanghai and Japan are so nearly antipodal to Chili, that an air-line, 10,800 miles in length, will reach Valparaiso almost equally well, whether you project it north, south, east, or west. To reach Valparaiso from these ports, you have to make nearly 180° of longitude, and the question is, in which hemisphere will you run down this easting? If in the northern, you will have, for the sake of the winds, to run to the north of your place of departure; and if in the southern, you will, for the same reason, have to run to the south of your port. So, in that respect, it is as broad as it is long; but the "brave west winds" of the southern hemisphere will decide this question for us.

This point being settled, the question is, will you run down for those winds by passing to the east or the west of New Holland; clearly not to the west if you take your departure from Shanghai or Japan. From Hong-Kong there is room for difference of opinion, and I have not observations enough on the winds and currents of those seas to enable me to decide. The shortest distance from Canton west of New Holland that winds and water will allow, is about 500 miles less than it is east of New Zealand, and 800 miles less than it is by the south side of that island and east of New Holland; and the route east contemplates your going as far as the variables of the northern hemisphere, say between the parallels of 30° and 35° north, in order to get far enough east to clear New Holland. The question of going west of New Holland is debatable only during the strength of the N. E. monsoons, or from October to March inclusive. During the rest of the year, east of New Zealand is the route.

And during the monsoon season, the question as to routes from Hong-Kong resolves itself into one of this form: Are the winds through the China Sea and the Indian Ocean so much better than they are out upon the Pacific, that you can pass through the Straits of Sunda, clear the calm belt of Capricorn in about 110° E., and then get south of New Zealand and reach the meridian of 140° W. at its intersection with the parallel of 50° S., sooner than you can by proceeding from Hong-Kong as though you were bound to California, until you reach the meridian of 145° or 150° east; then turn south, and with such winds as you have there, run for the line in 170°, and thence east of New Zealand and so on for 50° S. in 140° W.

The winds along the eastern route (east of New Zealand), from Hong-Kong, Shanghai, and Japan, as far as 50° S. correspond to those along the route from Havana, from the Capes of Virginia, and from Boston to Rio, and ports beyond. Havana is in lat. 23° N., long. 82° W.: let us run a parallel between this eastern route from Hong-Kong and the route to Rio from Havana, for the similarity between the other routes, taken by pairs, the Capes and Shanghai, Boston and Hakodadi (lat. 41° 49′ 22″ N., long. 140° 47′ 45″ E.), is obvious, and needs no pointing out. The vessel from Hong-Kong is recommended to cross the equator

in 165° or 170° E.: that is, between 50° and 60° east of her starting-point: therefore she has to make 50° or 60° of longitude before crossing the line; and the vessel in the Atlantic has to do the same from Havana before she crosses the line. They both have to run up to the northward and eastward, in order to get in the variables to make easting before they turn down for the equator. They both have a current in their favor, and though the current for the Canton vessel is not quite as strong as the Gulf Stream, yet the winds in the China seas, for at least half the year, are more reliable, which will, probably, more than compensate for the difference in the currents, and make the average from Canton to the line in 170° E., a little less than that from Cuba to the line in 30° W. I confess that this route to Valparaiso looks, upon further reflection, more tempting, especially in the spring, than I at first thought it to be.

I recommend the western route only in the N. E. monsoons, and when they do not admit of a good offing for the eastern route. In December, your Flying Cloud made the run from Hong-Kong to Java Head in 7 days. When winds are fair for such runs as that, the western route is the passage. And the question as to routes, like the route north or south of Ireland, from Liverpool to New York, ought to be decided at the moment of coming out of port, and finding how the wind is. The only reason, you will understand, why I recommend crossing the line so far to the eastward, is because there is both more sea room and better winds than nearer the land; at least I so infer; for, as I have said before, the materials for my Charts in that part of the ocean are rather scanty.

But let us illustrate this question of route from Hong-Kong a little further: you recollect the position in the South Atlantic of the Isles of Sandwich Land? The route from Havana to them would be along the road to Rio, until you reach the parallel of 23° S. Now suppose there were a ship canal—a Strait of Sunda—across the Isthmus of Panama, and you were going to send a vessel from Cuba, for seal skins, to Sandwich Land, would you send her through the Isthmus down across the S. E. trades of the Pacific, and so around Cape Horn to those islands? This would be like sending your vessel from Hong-Kong down through the Straits of Sunda and so around New Holland and along the south side of New Zealand to 140° W., and 50° S., on the way to Valparaiso.

Or would you send her from Havana first up to 30°–35° north, and so down along the Rio route in the Atlantic? This would be like sending your vessel from Hong-Kong up towards Japan, and so to the east of New Zealand down to 50° S., 140° W., on her way to Valparaiso.

Before I go further in discussing routes, I'll state you the shortest practicable distance by the several routes from Hong-Kong to Valparaiso:—

From Hong-Kong *via* Straits of Sunda and south of New Holland,					11,400 miles.
" " *via* 33° N. and 150° E., to 0° and 163° E., and S. of New Zealand,					12,200 "
" " " "	157° E., "	170° E.,	" "		11,900 "
" Shanghai and *via* "	" "	"	" "		11,100 "
" " "	150°	163° S.	"		11,500 "
" Japan "	"	"	"		10,900 "
" " "	157°	170° E.	"		10,400 "

So you observe that the route east of New Holland and south of New Zealand is the longest; and the route west from Hong-Kong is 500 miles shorter than the route which passes east of New Zealand, and this is the route which I think experience will probably prove to be the best in the long run; certainly from Shanghai and Japan it is the best.

I give the preference to the east side of New Zealand, because better winds are found along that route, and which will probably more than make up for the difference of distance from Hong-Kong. I take it that a vessel steering from 30° or 35° N. in the Pacific, and entering the N. E. trades in April, will be able to make with a good "rap full" a course between S. E. and S. S. E. to the line, and that after crossing the line and entering the S. E. trades, she will be able to make a course through them with not more than one point westing, she keeping topmast studding-sails set. From the equator, and between 170° and 175° west of New Zealand is plain sailing; therefore, if after turning to the southward and eastward from 30° N., or whatever be the parallel attained, the winds will, without pinching, allow you to cross the line between 170° and 175° E., do so, and then stand as straight as the wind will allow you, for the "brave west winds" of the extra-tropical south, shaping your course for 50° S. about the meridian of 140° W., taking care not to recross the parallel of 45° to the west of 90° W. If it be found practicable to accomplish this route, the distance will be about 11,900 miles. I am particular in stating these distances to you, because your intelligent navigators, in case they be pinched, will have no difficulty in determining which side of New Zealand to pass. Of course you will understand there is no virtue in the parallel of 30° N., I only indicate that as the lowest parallel upon which, in the month of April, good westerly winds will prevail. Now, with all these preliminaries before you, the instructions are, after getting an offing from Hong-Kong, make the best of your way to the meridian of 150° E., without making any southing; and the nearest way to get there, that is great circle, is to reach say the parallel of 30° N., long. 137° east. So you observe that it is not much out of the way to run up to 30° or even 35° N., for the sake of better winds. With a smart ship and a smart navigator on this route, he will reach the line in 25 days—in April, it may be done in 18, and perhaps sooner in other months; it will take him thence 15 days to cross the S. E. trades and get into the "brave west winds" of the South Pacific.

Suppose he gets them in 48°, long. 180°, he will be into Valparaiso in 25 days more.

So tell your captain that you expect him to make the passage, if he succeed in getting clear of the Asiatic coast without delay, in about 70 days. He ought to average, through this route, 175 miles a day, which would, with one day for an offing, give him a passage of 68 days.

Wishing both you and him good luck till you are tired of it,

I remain yours, truly,

LEWIS W. TAPPAN, ESQ., M. F. MAURY.

Messrs. SAMPSON & TAPPAN, BOSTON.

P. S.—Pray caution your captain, after he gets south of the S. E. trades, not to be deceived with the first spirt of westerly winds, because they will die away after a few days, and then he will have to go south to look for them again; but when he gets between 48°, and 50°, he will generally find that a good belt for them, and then he may "stick her away" east.

FROM VALPARAISO TO CALCUTTA.

I have advised a shipmaster, who consulted me as to this route, to go by the way of Cape Horn. The distance by the cape being 10,500 miles; and the distance by the usual route west, or "running down the trades," as it is called, being 13,000 miles, or 2,500 greater. The difference in time will be quite as great as this difference of distance would indicate. Indeed, in addition to distance, time is also in favor of the Cape Horn route, for the winds are stronger, and quite as fair.

As one stands at the equator in the Atlantic, and looks south upon the chart, he sees a part of the ocean, in the shape of the letter V, which is untravelled except by whalemen and sealers. The track to and around the Cape of Good Hope forms one side of the letter; the track to and fro around Cape Horn, the other. Between these two sides, the ocean is a solitude. Among the many thousand merchant logs that are on file here, there is not one to show that any trader has ever performed the voyage from the offings of Cape Horn to the offings of the Cape of Good Hope.

The way, by the Cape Horn route to India, is to proceed from Valparaiso as though you were homeward bound around the Cape, and then, with the "brave west winds" which prevail there, to run east with flowing sheets, passing between the isles of South Georgia and Sandwich Land, keeping a bright lookout for icebergs. The route thence crosses the prime meridian in about 54° lat., 20° E. in 50°, 35° E. in 40°, by which time the navigator will again find himself in the travelled thoroughfares, and will know how to proceed.

Distance from Valparaiso, *via* Cape Horn route,		Western, or usual route,
To Canton	11,500 miles.	10,800 miles.
" Shanghai	12,200 "	10,500 "
" Java Head	9,700 "	

In the southern summer, the voyage from Valparaiso to Canton may, on account of the winds, be performed quite as quickly *via* Cape Horn, as it may be by the route west. If the "brave west winds" will enable a ship, by Cape Horn, to average only 10 miles a day more during the voyage, than she can in "running down the trades" west, time, which now is worth so much in navigation, would be somewhat in favor of the Cape Horn route even to Canton.

FROM THE SANDWICH ISLANDS TO CALIFORNIA.

From San Francisco to the islands, the way is plain; for, by running to the southward and westward from the offings of San Francisco, you get the N. E trades, and carry them all the way.

In returning, the course is to the northward, and as the winds will let you, lay up till they are found to be fair. On this voyage, the navigator, as a rule, will always have to go to the northward of San Francisco

to be sure of good winds, which are frequently found near the parallel of 38°, but sometimes, as from July to September, inclusive, as far as 44–5°.

The islands, such as the Society and Sandwich, that stand far away from any large extent of land, have a very singular but marked effect upon the wind. They interfere with the trades very often, and turn them back; for westerly and equatorial winds are common at both these groups, in their winter time. Some hydrographers have taken those westerly winds of the Society Islands to be an extension of the monsoons of the Indian Ocean. Not so: they are local, and do not extend a great way either from the Sandwich or Society Islands.

That they are local about the former group, an examination of sheet No. 5, Pilot Chart North Pacific, will instantly show.

It is a curious thing, is this influence of islands in the trade-wind region upon the winds in the Pacific. Every navigator who has cruised in those parts of that ocean, has often turned with wonder and delight to admire the gorgeous piles of cumuli, heaped up and arranged in the most delicate and exquisitely beautiful masses that it is possible for fleecy matter to assume. Not only are these piles found capping the hills among the islands, but they are often seen to overhang the lowest islands, and even to stand above coral patches and hidden reefs, "a cloud by day," to serve as a beacon to the lonely mariner out there at sea, and to warn him of shoals and dangers, which no lead nor seaman's eye has ever seen, or sounded out.

These clouds, under favorable circumstances, may be seen gathering above the low coral island, and performing their office in preparing it for vegetation and fruitfulness in a very striking manner. As they are condensed into showers, one fancies that they are a sponge of the most exquisite and delicately elaborated material, and that he can see, as they "drop down their fatness," the invisible hand aloft that is pressing and squeezing it out.

These winds at the Sandwich Islands often come from the south as well as the west; and on such occasions, they afford vessels bound for any of the Pacific ports of North America, a fine opportunity of running to the northward, clearing the N. E. trades, and getting the westerly winds of the variables beyond.

Capt. Paty, as the following letter shows, has been one of the most successful navigators in the Sandwich Island and California trade, and therefore I quote a few of his tracks in illustration of the route from the Sandwich Islands to San Francisco.

San Francisco, *Feb.* 15, 1855.

Lieut. M. F. Maury, U. S. N.,

Superintendent of National Observatory, Washington, D. C.

Dear Sir: I take great pleasure in handing you, inclosed, copies of logs kept by Capt. John Paty, between this city and Honolulu. Capt. Paty has been running constantly on this route and between Honolulu and China, ever since 1837, and has, he informs me, been here every winter once, at least, since that time, and probably has more experience in this trade than any commander here. The logs I inclose, please find as follows:—

San Francisco to Honolulu.

Clipper brig Zoe, Sept. and Oct., 1853	16 days.
" " Zoe, Jan. and Feb., 1854	20 "
" schooner Restless, April and May, 1854	12 "
" " " June, 1854	11 "
" " " October, 1854	14 "

Honolulu to San Francisco.

Clipper brig Zoe, Oct. to Nov., 1853	14 days.
" " " January, 1854	13 "
" schooner Restless, April, 1854	13 "
" " " May and June, 1854	16 "
" " " July and August, 1854	21 "
" barque Francis Palmer, February, 1855	11 "

The abstract log of the Francis Palmer shows her passage to be remarkable, from the fact that it is the shortest ever made *upward.* Capt. Paty feels confident that, with the F. P., he both can and will make the passage up in ten days. The U. S. ship St. Mary's, Capt. Bailey, left Honolulu 28 hours before the F. P., and arrived here in the second best passage on record. The barque F. Palmer beat her 27½ hours to the Heads, and 15 hours to the anchorage. The barques Hermione and Fanny Major, half clippers, sailed a few days previous from Honolulu, and arrived in company in 14 days' passage. Other full model vessels were 21 days; but, I think, steered different courses. Most of the inclosed logs are on common writing-paper, as your agent being out of abstract logs, I was unable to procure any. I hope soon to be able to forward you a table of passages both up and down, complete since 1850.

I have a few more logs to forward you, not yet completed. I am with Messrs. G. B. Post & Co., who are the oldest and leading house in the Sandwich Island trade. They own a line of clipper vessels running to Honolulu, leaving every eight or nine days, whose journals, if furnished to you, would, I am sure, be of great service in your valuable researches, and aid you in establishing the proper track for approaching our coast at all months of the year. Capt. Paty differs with you a little, I believe, on this subject, and believes that the best way to approach our coast is from the northward. He hopes to have the pleasure of writing you on the subject before long.

I cannot but feel great interest in all researches in this, my favorite study, having kept the abstract log of two long voyages for your office, one of ship Singapore to Calcutta and back, and one around the world in the clipper ship John Gilpin, on her first voyage, and thoroughly studied your valuable Sailing Directions, a copy of which you kindly presented me a year ago, at Washington, when at the Observatory with my father and Mr. Sidney Brooks, of N. Y.

My duties are constant, but I shall be happy at all times to render you any service in my power, to help you in your great work. The track up requires the most skill in navigating; the track down is

pretty generally understood. The average of passages up from Honolulu to San Francisco is, in length to the passage down, as 6 to 5. Therefore, *ten* days down is no better than *twelve* days up, and *vice versa*.

My address is care of Messrs. G. B. Post & Co., San Francisco.

I remain yours, very respectfully,

CHAS. WOLCOTT BROOKS.

Abstract Log of the Brig Zoe (JOHN PATY). *From Honolulu to San Francisco.*

Date.	Latitude.	Longitude.	WINDS.		
			First part.	Middle part.	Latter part.
December 30, 1853	22° 52′	156° 40′	E. N. E.	E. N. E.	E. N. E.
31, "	24 57	155 50	E. N. E.	E. N. E.	E. N. E.
January 1, 1854	27 40	154 00	East	East	E. S. E.
2, "	31 05	153 30	S. E.	S. E. by S.	S. E. by S.
3, "	32 22	150 30	S. S. E.	S. S. E.	S. S. E.
4, "	34 38	148 07	S. W.	S. W.	N. W.
5, "	34 20	147 55	North	North	North
6, "	36 05	143 50	N. E.	N. E.	East
7, "	37 44	139 50	E. S. E.	S. E.	E. S. E.
8, "	37 40	136 30	S. S. E.	S. S. W.	S. S. W.
9, "	37 20	135 30	S. W.	W. S. W.	W. S. W.
10, "	38 05	133 30	West	Calm	Calm
11, "	37 40	129 50	S. E.	S. E.	S. W.
12, "	37 40	126 40	S. W.	S. W.	S. W.

Dec. 30. Sailed from Honolulu; fresh breezes and pleasant.

Dec. 31. Fine breezes.

January 1, 1854. Fresh breezes.

Jan. 2. Fresh breezes and heavy sea.

Jan. 3. Fresh breezes; first part, rain; latter part, clear.

Jan. 4. Light breezes and pleasant.

Jan. 5. Fresh breezes and cloudy.

Jan. 6. Strong breezes; carried away fore-topgallant mast.

Jan. 7. Fresh gales throughout, with a very rough sea.

Jan. 8. Fresh gales.

Jan. 9. Comes in light airs; middle and latter parts, becalmed.

Jan. 10. Very light airs.

Jan. 11. Fine breeze throughout, weather thick and foggy.

Jan. 12. Light breezes and foggy weather; at 5 A. M. sighted land near Point Reys, and at 11 A. M. made fast to Cunningham's wharf, in 13 days from Honolulu.

N. B.—The U. S. sloop Portsmouth sailed from Honolulu 24 hours before the Zoe, and arrived at Sancolito 24 hours before the Zoe, making the same time. The loss of our fore-topgallant mast retarded our progress some, as we had no spar to replace it.

Abstract Log of the American Clipper Barque Francis Palmer (JOHN PATY). *From Honolulu, Sandwich Islands, to San Francisco, California,* 1855.

"THE QUICKEST PASSAGE ON RECORD."

Date.	Latitude at noon.	Longitude at noon.	Course.	Distance.	WINDS. First part.	WINDS. Middle part.	WINDS. Latter part.
Jan. 30						N. W.	N. W.
31	22° 07′	156° 07′	N. 76° E.	106	N. W.	S. W.	W. S. W.
Feb. 1	25 31	152 07	N. 47° E.	302	S. W.	S. W.	S. W. by W.
2	27 50	150 04	N. 46° E.	194	S. S. W.	N. W.	N. W.
3	29 51	147 34	N. 47° E.	180	West	South	West
4	32 01	144 31	N. 50° E.	205	W. S. W.	W. S. W.	West
5	33 19	141 03	N. 66° E.	193	West	N. W.	N. by W.
6	34 10	139 16	N. 60° E.	102	N. N. W.	Calm	South
7	35 42	135 55	N. 60° E.	190	South	S. W.	N. W.
8	37 09	130 07	N. 72° E.	296	South	S. E.	South
9	38 12	124 04	N. 74° E.	252	South	South	South
10					S. E. by E.	S. S. E.	

Jan. 30. Light breezes and pleasant. At 6 P. M. the steam-tug left us; made all sail, standing along shore, with light airs and clear weather.

Jan. 31. Light airs and pleasant weather. At noon, Molakai bore S. S. W., say 48 miles.

Feb. 1. Comes in gentle breezes; ends strong breezes and all sail; going 15 knots—average, $12\frac{7}{12}$.

Feb. 2. Comes in fresh gales; at 10 P. M. wind hauled to N. W.; double-reefed the topsails; at 8 A. M. made sail again.

Feb. 3. Comes in light breezes; thick weather, with rain.

Feb. 4. Brisk breezes, with all sail; weather squally.

Feb. 5. Comes in brisk breezes and squally; at 4 P. M. braced sharp up, with light, baffling breezes, and squally weather.

Feb. 6. Light airs and pleasant; middle, calm.

Feb. 7. Comes in brisk breezes; middle, moderate; ends light breezes and cloudy.

Feb. 8. Comes in light, baffling breezes and rainy; ends fresh breezes; all sail.

Feb. 9. Fresh gales and cloudy; at 2 P. M. in royals and topgallant studding-sails; at daylight, the water was discolored; on soundings, ship going from 12 to 15 knots during the day.

Feb. 10. Brisk breezes and thick weather;* at 6h. 30m. P. M. shortened sail and wore ship, judging Point Lobos to bear E. N. E., say 6 miles; weather being too thick to run in for the Heads, reefed the topsails and furled the courses, and *stood off shore under easy sail;* at 3 A. M. wore ship to the E. N. E., and stood in shore again for one hour; at 4 A. M. wore ship to the S. and W., standing off shore *waiting for daybreak;* at sunrise, weather clearing up; made all sail, and stood in for the Heads; arrived at 7 A. M., and hauled in at Cunningham's Wharf, after a passage of *eleven days;* made the run from land to land (from Molakai to the Heads of San Francisco), in *nine days* and *two hours!*

* Telegraphed. At sundown, weather thick; a clipper barque five miles west, inward bound.—*Vide* Point Lobos Marine Report, in *Alta California,* of date.

Abstract Log of the Clipper Schooner Restless (JOHN PATY). *From Honolulu to San Francisco.*

Date.		Latitude.	Longitude.	WINDS.		
				First part.	Middle part.	Latter part.
April	2, 1854	23° 40′	154° 20′	S. W.	N. W.	S. E.
	3, "	25 55	151 51	S. W.	West	West
	4, "	26 55	151 51	N. W.	N. N. E.	N. N. E.
	5, "	29 06	152 09	N. N. E.	East	N. E.
	6, "	30 56	150 30	S. S. E.	Calm	Calm
	7, "	30 47	146 20	Calm	North	North
	8, "	30 37	143 45	North	N. E.	N. W.
	9, "	31 08	143 00	S. W.	W. N. W.	W. N. W.
	10, "	33 40	141 07	Calm	W. N. W.	S. W.
	11, "	35 28	138 14	West	West	W. S. W.
	12, "	36 51	134 37	S. W. by W.	South	South
	13, "	37 16	131 36	S. E. by S.	S. E. by S.	S. E. by S.
	14, "	37 33	129 10	S. E.	S. E.	S. E.
	15, "	Arrived		North	North	North

April 2. Gentle breezes and fine weather.

April 3. Gentle breezes and fine weather.

April 4. Gentle breezes and fine weather.

April 5. Gentle breezes and fine weather.

April 6. Gentle breezes and fine weather; ends calm.

April 7. Comes in calm; ends fresh breezes, with rain; lat. 30° 47′; long. 146° 20′.

April 8. Fresh breezes.

April 9. Very light breezes.

April 10. Very light breezes.

April 11. Light, gentle breezes.

April 12. Gentle breezes and fair weather.

April 13. Gentle, light breezes.

April 14. Moderate breezes.

April 15. Strong breezes, with all sail set; fine run; arrived at San Francisco at 2 P. M., and made fast to Cunningham's Wharf.

Abstract Log of the Clipper Schooner Restless (JOHN PATY). *From Honolulu to San Francisco.*

Date.	Latitude.	Longitude.	Bar.	WINDS.		
				First part.	Middle part.	Latter part.
May 21, 1854	23° 30′	155° 10′	29.30	N. E.	N. E.	N. E.
22, "	26 00	159 20	29.35	N. E.	N. E.	N. E.
23, "	28 46	160 11	29.40	N. E.	N. E.	N. E. by E.
24, "	31 41	160 19	29.50	N. E. by E.	N. E. by E.	N. E. by E.
25, "	34 51	160 11	29.60	N. E. by E.	N. E. by E.	N. E. by E.
26, "	37 08	160 09	29.60	N. E. by E.	N. E. by E.	E. N. E.
27, "	39 05	158 10	29.60	East	East	S. E.
28, "	40 25	155 00	29.60	S. E. by E.	S. E. by E.	S. E. by E.
29, "	41 19	150 51	29.60	E. S. E.	S. S. E.	S. S. E.
30, "	41 28	146 25	29.60	S. S. E.	S. S. E.	S. S. E.
31, "	41 30	144 30	29.60	South	Calm	Calm
June 1, "	41 30	143 00	29.60	West	West	Westerly
2, "	41 00	140 45	29.60	West	West	West
3, "	39 16	136 50	29.60	West	N. E.	N. E.
4, "	38 40	132 00	29.40	N. N. E.	N. N. E.	N. N. E.
5, "	37 39	129 00	29.30	North	North	North
6, "	37 50	124 00	29.25	N. W.	N. W.	W. by S.

May 21. Pilot left; at 8 A. M. strong E. N. E. wind and pleasant.

May 22. Squally at midnight.

May 23. Fresh breezes and fair weather.

May 24. Fresh breezes and fair weather.

May 25. Fresh breezes and fair weather.

May 26. Gentle breezes and fair weather.

May 27. Comes in light; ends fresh breezes.

May 28. Fine breezes; passed a schooner standing in company.

May 29. Light breezes and fine weather.

May 30. Gentle breezes and fine weather.

May 31. Gentle breezes and fine weather.

June 1. Light airs; came up to, spoke, and passed barque Julia Ann, 21 days from Havana.

June 2. Light airs; Came up to, spoke, and passed French barque Dumont de Urville, bound to San Francisco.

June 3. Fresh breezes; passed schooner Supply; she left Oahu 5 days before us.

June 4. Fresh breezes and pleasant.

June 5. Light breezes and clear weather.

June 6. Fine breezes and clear; at 5 P. M. arrived, and reported the Japan Treaty. Capt. Adams, bearer of dispatches to Washington, left as passenger in the clipper barque Wavelet, four days previous to my sailing, and he arrived at San Francisco on the 8th. We beat schooner Supply 13 days.

Abstract Log of the Clipper Schooner Restless (JOHN PATY). *From Honolulu to San Francisco.*

Date.	Latitude.	Longitude.	Bar.	WINDS.		
				First part.	Middle part.	Latter part.
July 15, 1854	25° 42′	157° 30′		E. N. E.	E. N. E.	E. N. E.
16, "	28 31	157 07		E. by N.	N. E. by E.	E. N. E.
17, "	31 25	158 05	29.25	E. N. E.	E. N. E.	E. N. E.
18, "	34 08	157 20	29.30	N. E.	N. E.	East
19, "	36 20	156 00	29.50	E. by N.	East	E. by S.
20, "	38 56	154 50	29.60	East	East	E. N. E.
21, "	41 13	153 45	29.60	E. by S.	E. N. E.	E. N. E.
22, "	43 15	153 45	29.65	East	East	East
23, "	45 20	151 20	29.70	E. by N.	E. by N.	E. N. E.
24, "	42 07	148 33	29.60	E. by N.	E. N. E.	E. N. E.
25, "	41 45	147 20	29.40	N. E.	E. N. E.	E. N. E.
26, "	42 50	147 22	29.50	N. E.	E. N. E.	E. N. E.
27, "	42 20	146 00	29.45	N. E.	E. N. E.	E. N. E.
28, "	41 07	144 00	29.45	N. E.	E. N. E.	N. E.
29, "	41 30	142 53	29.50	N. E. by E.	N. E. by E.	N. E. by E.
30, "	40 50	141 30	29.49	E. N. E.	N. E.	N. E.
31, "	40 49	140 16	29.50	N. E.	N. E.	N. E.
Aug. 1, "	40 30	138 30	29.50	N. E.	N. E.	N. E.
2, "	40 30	137 30	29.45	Calm	Calm	N. E.
3, "	37 34	136 20	29.40	North	N. W.	W. N. W.
4, "	37 40	130 05	29.25	West	West	West
5, "	37 42	123 37		W. N. W.	N. W.	West

July 15. Sailed from Oahu with gentle breezes and fine weather.

July 16. Gentle breezes and fine weather.

July 17. Gentle breezes and fine weather.

July 18. Gentle breezes; latter part, squally and rough sea.

July 19. Squally weather; split flying jib.

July 20. Squally weather.

July 21. Squally weather; rough sea.

July 22. Squally weather.

July 23. Gentle breezes and pleasant.

July 24. Gentle breezes; latter part, fresh breezes and rough sea.

July 25. Gentle breezes and pleasant.

July 26. Light airs; tacked several times; pleasant.

July 27. Light airs; tacked several times; pleasant.

July 28. Light breezes and pleasant.

July 29. Light breezes and pleasant; tacked at midnight.

July 30. Light breezes and pleasant.

July 31. Light baffling winds and calms.

Aug. 1. Light baffling winds and calms.

Aug. 2. Light baffling winds and calms.

Aug. 3. Good breezes and pleasant.

Aug. 4. Strong breezes and pleasant.

Aug. 5. Strong breezes and clear; sighted the North Farallones, at 3° 30′ P. M. and hauled in at G. B. Post & Co.'s wharf.

Abstract Log of the Clipper Brig Zoe (JOHN PATY). *From Honolulu to San Francisco.*

Date.	Latitude.		Longitude.		Bar.	WINDS.		
						First part.	Middle part.	Latter part.
Oct. 24, 1853	24°	40′	157°	10′	29.4	E. N. E.	E. N. E.	E. N. E.
25, "	26	57	157	00	29.4	E. N. E.	East	East
26, "	29	13	156	10	29.4	E. by S.	E. by S.	East
27, "	30	43	154	10	29.5	E. by S.	E. S. E.	South
28, "	32	12	152	42	29.5	S. S. W.	S. S. W.	S. S. W.
29, "	34	17	150	10	29.6	S. S. W.	S. S. W.	S. S. W.
30, "	35	20	147	35	29.7	S. S. W.	South	S. S. E.
31, "	37	39	145	20	29.7	E. S. E.	S. E. by E.	S. E. by E.
Nov. 1, "	39	24	142	16	29.6	E. S. E.	S. E. by E.	East
2, "	40	24	139	05	29.5	E. S. E.	S. E.	S. S. E.
3, "	40	14	136	10	29.4	S. S. E.	S. S. E.	S. by E.
4, "	39	30	132	30	29.4	S. by E.	South	S. W.
5, "	38	51	129	30	29.4	S. W.	W. N. W.	N. W.
6, "	37	40	124	29	29.2	N. W.	N. W. by W.	N. W.

Oct. 24. Beat round south part Oahu; strong trade-wind and fine weather.

Oct. 25. Squally about midnight; trade-wind and fine weather.

Oct. 26. Good breezes and pleasant weather.

Oct. 27. Gentle breezes and pleasant; saw a ship steering S. E.

Oct. 28. Gentle breezes and pleasant.

Oct. 29. Gentle breezes and pleasant.

Oct. 30. Gentle breezes and pleasant.

Oct. 31. Moderate breezes and fine weather.

Nov. 1. Moderate breezes and fine weather.

Nov. 2. Moderate breezes and fine weather.

Nov. 3. Moderate breezes and fine weather.

Nov. 4. Moderate breezes and fine weather.

Nov. 5. Moderate breezes and fine weather.

Nov. 6. Arrived at San Francisco.

FROM THE SANDWICH ISLANDS, HOME.

South of the calms of Capricorn, the winds are the same all round the world. Taking them on the meridian of the Cape of Good Hope, and between the parallels of 45° and 50° south, a fast ship may run with them to the eastward, averaging upwards of 200 miles a day all the way round to Cape Horn.

Capt. McKay, in his passage of 83 days, in the Sovereign of the Seas, from the Sandwich Islands to New York, carried the S. E. trades down to the parallel of 45° south. There, he found the baffling winds peculiar to the horse latitudes; after crossing the parallel of 48°, he cleared this belt, and took the famous westerly winds which wafted him along so finely.

There is warm water, an Australian gulf stream, to be crossed or drifted along with, between Port Philip and Cape Horn. In the paper on the Gulf Stream, which is referred to at p. 234 of this work, the existence of such a body of warm water was theoretically pointed out; it is marked on Plate XIX., and the abstract log of the Sovereign of the Seas gives practical proof of its existence, as the following extract will show:—

Date.	Lat. S.	Long. W.	Temp. air.	Temp. water.
March 8	47° 49′	158° 30′	70°	70°
9	48 26	156 23	67	65
10	48 25	151 24	65	65
11	48 15	143 44	60	60
12	48 19	136 32	60	62
13	48 40	129 19	40	43
14	48 58	125 00	43	42

Here is a change of 19° in the temperature of the water in one day's run; and from the parallel of 47° 49′ to that of 48° 40′, though the difference of latitude is less than one degree, the difference in the temperature of the water is 27° !

I shall not now stop to go over what has already been said (p. 170) about the genesis of this warm water and warm current; suffice it for our present purpose to say, it receives its warmth in the equatorial regions; but whether in the Indian Ocean or in the torrid zone of the Pacific, it is immaterial for our present purpose. We know it comes from warmer latitudes than those in which the Sovereign of the Seas found it; and, therefore, it has southing, and, if southing, probably easting also, in its course.

In like manner, the cold water into which this ship ran from the warm, we may, for like reasons, suppose to come from towards the polar regions, and to be bound probably to the coast of Peru, there to feed that remarkable current which was discovered by Humboldt, and which runs up as far as to the Galapagos Islands, where it probably joins the equatorial current that flows west from the meridian of 100° W. in the torrid zone of the Pacific; and which, taking a sweep down towards the Society Islands, may

complete the circuit, and so feed the warm current of which I have been speaking. Is this cold current in 45°, or 50°, or 55° south, an ice-bearing current? (*Vide* Plate XIX.)

Vessels bound around Cape Horn from any of the inter-tropical islands of the Pacific, should run south through the trades with topmast studding-sails, make for the trade-like westerly winds of the South Pacific, and with them run down their easting for Cape Horn.

I may quote the abstract log of the Sovereign of the Seas, McKay, on her celebrated run from Oahu to New York, in 1853.

This log will also serve still farther to illustrate these Sailing Directions for the homeward passage from Australia.

The Sovereign of the Seas is one of the glorious fleet of a thousand sail that is voluntarily engaged in making observations for the Wind and Current Charts. She it is, it will be recollected, who, taking them for her guide, made the extraordinary run of one hundred and three days from New York to San Francisco, both crossing the equator in the Pacific and arriving in port on the day predicted.

Returning from the Sandwich Islands to New York, in the remarkably short run of eighty-three days, she passed through a part of the Great South Sea, which, up to that time, had been seldom traversed by traders—at least, I had the records of very few that had.

Little or nothing, except what conjectures suggested, was known as to the winds in this part of the ocean. The results of my investigations elsewhere, with regard to winds and the circulation of the atmosphere, had enabled me to announce as a theoretical deduction, that the winds in the "variables" of the South Pacific would probably be found to prevail from the westward with a trade-wind like regularity.

Between the parallels of 45 and 55 degrees south, and from the meridian of the Cape of Good Hope eastward, around to that of Cape Horn, there is no land or other disturbing agent to intercept the wind in its regular circuits; here the winds, it was conjectured, would be found blowing from the west with greater force than from the east in the trade-wind regions; and, giving rise to that long rolling swell peculiar to those hyper-austral regions of the Pacific, they would enable ships steering east to make the most remarkable runs that have ever been accomplished under canvas.

The Sovereign of the seas has afforded the most beautiful illustration as to the correctness of these theoretical deductions.

Leaving Oahu for New York, *via* Cape Horn, February 13, 1853, she stood to the southward through the belts, both of the northeast and the southeast trades, making a course good on the average through them, a little to the west of south. She finally got clear of them, March 6, after crossing the parallel of 45° S., upon the meridian of 164° W.

The 8th and 9th, she was in the horse latitude weather of the southern hemisphere. So far, her run had been good, but there was nothing remarkable in it.

Having crossed the parallel of 48° S., she found herself, on the 10th, fairly within the trade-like west winds of the Southern Ocean; and here commenced a succession of extraordinary days' runs that have been seldom equalled, rarely surpassed.

From March 9 to March 31, from the parallel of 48° S. in the Pacific, to 35° S. in the Atlantic, during an interval of twenty-two days, that ship made 29 degrees of latitude, and 126 of longitude. Her shortest day's run during the interval, determined by calculation, from the position given in the log, being 150 knots. The wind, all this time, is not recorded but once with easting in it; it was steady and fresh from the westward.

In these twenty-two days, that ship made five thousand three hundred and ninety-one nautical miles. The predicted triumph of canvas under these west winds over steam elsewhere is already realized; for here is a ship under canvas, and with the winds alone as a propelling power, and with a crew, too, so short, the captain informs me, that she was but half manned, accomplishing, in twenty-two days, the enormous run of six thousand two hundred and forty-five statute miles (one-fourth the distance round the earth), and making the daily average of two hundred and eighty-three statute miles and nine-tenths (283.9). During eleven of these days consecutively, her daily average was three hundred and fifty-four statute miles; and during four days, also, consecutively, she averaged as high as three hundred and ninety-eight and three-quarter statute miles.

This abstract log will also illustrate very well the homeward passage from the islands in the Pacific generally; that is, the way home thence is in all cases to run down south until you get into the westerly winds, and then bear away east.

Captain McKay made only one mistake by the way, and that was in getting from the S. E. trades through the belt of the horse latitude weather into the N. W. trades, I may call them, of the southern hemisphere.

In passing from one system of trades to the other, or from the trades to the variables, there is always a debatable ground which belongs neither to trades nor variables. This debatable ground between the trades about the equator is called the doldrums. Between the trades and the variables of the extra-tropical regions, it is called the horse latitudes.

In these debatable grounds, calms and baffling winds are to be expected, sometimes of several weeks, and often of many days, and occasionally of only a few hours' duration. And the rule for crossing these belts is, whenever there is sea-room, to steer due north or south according to your destination.

Therefore, in coming from the Sandwich or the Society Islands, or California to Cape Horn, the rule should be to go south as fast as possible, in order to get in the N. W. trade-wind region of that ocean with its heaving swells. Until you get into the region of these winds, no course can be given. The best passages are to be made by crossing the trades with topmast studding-sails set.

And in illustration of this, I might refer to the abstract log of the Sovereign of the Seas, as well as of the Comet and the Flying Dutchman from California. The last two ships, though they lost the S. E. trades in about 30°, did not get the regular westerly winds for some ten days afterwards, near the parallel of 48° or 50°.

All three of these ships were in this debatable ground of Capricorn in the Atlantic, from two to three days; the Sovereign of the Seas making only 68, 84, and 72 miles a day; the Comet, 27 and 43 miles on

two successive days; the Flying Dutchman, 46 and 104. Indeed, it may be said that these ships fell in with the baffling winds of the horse latitudes 3d of April, when they lost the N. W. trades.

Returning, therefore, to the route to Australia, and thence home *via* Cape Horn, I beg to impress navigators with the fact that I am not prepared to speak as to the ice that may be expected so low down as the parallel of 55° or 60° south, between the meridians of the Cape of Good Hope and Van Dieman's Land; and, therefore, navigators who take these Sailing Directions for their guide, must judge for themselves as to dangers from the ice by the route of which I am now treating. I have no reliable information upon that subject, except such as I have already quoted.

Abstract Log of the Ship Sovereign of the Seas (L. McKay), *bound from Honolulu to New York*, 1853.

Date.	Latitude at noon.	Longitude at noon.	Dist. per log.	Bar.	Ther. 9 A. M. Air.	Ther. 9 A. M. Water.	Winds. First part.	Winds. Middle part.	Winds. Latter part.	Remarks.
Feb. 12										Sailed from Honolulu.
13	19°21′ N.	158°16′ W.	168*	30.10	75°	77°	N. E.	Variable	E.	First part, fine; middle part, squally; ends, light.
14	18 10	159 10	89	30.10	75	77	E. to E. S. E.	S. E.	E. to N. E.	Nearly calm.
15	16 20	159 43	120	30.05	78	78	S. E.	S. S. E.	S. S. E.	Nearly calm; fine and clear.
16	12 27	160 28	265	30.00	75	78	S. S. E.	S. S. E.	E. by S.	First part, light breezes; ends, fresh and squally.
17	8 13	159 00	301	30.00	77	76	E. by S.	E. by S.	E. N. E.	Heavy breezes and cloudy weather.
18	4 20	157 42	302	30.00	81	79	N. E. by E.	N. E. by E.	E. to E. S. E.	Strong breezes and cloudy; rough sea.
19	2 40	158 49	166	30.00	80	80	S. E. by E.	S. E.	S. E.	Moderate weather.
20	0 47	160 50	156				S. E.	S. E.	S. E. by E.	Pleasant weather and light breeze.
21	2 27 S.	157 35	211	30.00	85	85	E. N. E.	E. N. E.	E. N. E.	Pleasant weather and light breeze.
22	5 47	159 38	199	30.10	85	83				Pleasant weather and light breeze.
23	8 32	160 03	164	30.00	87	85	E.	E.	E.	Pleasant weather and light breeze.
24	9 22	160 11	82	29.95	87	81	E. S. E.	Variable	S. S. E.	Light and variable.
25	11 44	160 10	140	29.90	85	83	E. N. E.	Variable	Variable	Squally with rain.
26	16 25	159 54	307				Variable	E.	E.	Strong breezes and squally, with heavy rain.
27	20 42	160 59	308	29.90	78	82	E.	E.	E.	Strong breezes and squally, with heavy rain.
28	24 34	160 41	231				E.	E.	E. N. E.	Steady breeze and clear.
Mar. 1	27 32 D. R.	159 36 D.R.	179	29.90	77	80	N. E. to S. E.	E. S. E.	N. E.	First part, variable winds and squally; ends, fresh.
2	30 17	159 20	173	29.92	78	78	N. E.	N. E.	N. E.	Light, variable winds, with heavy rain.
3	32 41	159 40	150	29.00	87	76	S. E. by E.	E.	E.	First part, light winds, with rain; ends, pleasant.
4	37 14	161 15	311	29.82	71	72	S. S. E.	S. S. E.	S. S. E.	Strong breezes and squally; sprung fore-topmast.
5	42 00	163 21	308	29.80	70	70	S. S. E.	S. S. E.	S. S. E.	Strong breezes and squally; heavy sea.
6	45 04	164 00	198	29.93	70	70	S. S. E.	E.	E. by N.	Strong breezes and squally; heavy sea.
7	47 07 D. R.		129				S. E. by E.	S. E. by E.	S. E. by E.	Moderate weather; fished fore-topmast.
8			96				N. E. by E.	N. E. by E.	N. E. by E.	Moderate weather.
9	48 26	156 23	169	29.90	67	65	N.	N. W.	N. W.	Moderate weather and pleasant.
10	48 25	151 24	271	30.05	65	65	N. W.	N. W.	N. W.	Fresh breezes and pleasant.
11	48 15	143 44	332	30.05	60	60	N. W.	N. W.	N. W.	Strong gales and heavy squalls during the night.
12	48 19	136 30	312	29.89	60	62	W. S. W.	W. S. W.	W. S. W.	Strong breezes throughout.
13	48 40	129 19	284	28.95	40	43	W. S. W.	N. N. W.	N. N. W.	First part, fresh breezes; latter part, heavy gales.
14	48 58	125 02	207				W. N. W.	N. W.	S. W.	Fresh gales and heavy sea; latter part, moderate.
15	49 00	118 46	275				W. S. W.	W. S. W.	W. S. W.	Fresh breezes and cloudy.
16	49 40	109 28	396				N. W.	N. W.	N. W.	Strong breezes and cloudy, with rain.
17	50 25	101 58	311	30.05	43	43	N. W.	N. W.	N. W.	Strong breezes and heavy sea.
18	52 12	91 28	411				N. W.	N. W.	N. W.	Strong breezes and rough sea.
19	55 18	84 03	360				N. W.	W.	W.	Strong westerly winds and heavy sea.
20	56 18	76 58	267	29.72	43	41	W. N. W.	W. N. W.	W. N. W.	Strong breezes and pleasant.
21	56 23	69 00	307	29.60	49	49	N. N. W.	N. N. W.	N. W.	Moderate breezes and pleasant; made Diego Ramirez, bearing E. by S., distant 15 miles.
22	55 17	64 50	172	29.60			N. N. W.	N. N. W.	N. N. W.	Light breezes and warm weather.
23	54 37	60 30	146	29.70	40	40	N. W.	N. N. W.	N. N. W.	First part, light breezes and pleasant; latter part, fresh and foggy.

* The distances in this column are the distances as given by the log.

Abstract Log of the Ship Sovereign of the Seas—Continued.

Date.	Latitude at noon.	Longitude at noon.	Dist. per log.	Bar.	THER. 9 A. M. Air.	THER. 9 A. M. Water.	WINDS. First part.	WINDS. Middle part.	WINDS. Latter part.	REMARKS.
Mar. 24	52°42′ S.	53°15′ W.	251	29.75	45°	45°	N. N. W.	N. W.	N. W.	Moderate breeze and foggy.
25	50 15	47 47	203	29.78	50	48	N. N. W.	W. N. W.	N. W.	Steady breezes and pleasant weather.
26	47 53	43 05	168	30.47			W. N. W.	W.	W. N. W.	Light breezes and pleasant.
27	44 39	43 24	190	29.95	47	47	W. N. W.	N. N. E.	N. W.	Light breezes and cloudy.
28	41 50	38 30		29.95	52	52				Light breezes and heavy sea.
29	39 19	34 20	237	30.10	54	54	N. E. by N.	N. E.	E. N. E.	Moderate breezes and cloudy.
30	37 30	31 18	183	30.52			N.	N.	N. by E.	Light breezes and pleasant.
31	35 28	29 57	188	29.95	63	63	N.	N. N. E.	N. N. W.	Strong breezes and squally; latter part, rainy.
April 1	34 10	28 11	161	29.90	67	66	N. N. E.	N. N. E.	N. W. by N.	Light breezes and pleasant.
2	32 13	30 47	171	30.12	67	67	N. by E.	N. N. E.	N. E.	Light breezes and pleasant.
3	31 09	29 16	105	30.15	73	73	N. by E.	N. by W.	N.	Light breezes and pleasant.
4	29 47	27 55	135				N. by W.	N. by E.	N. by E.	Light breezes and pleasant.
5	28 39	27 47	124	30.18	77	77	N.	N. by E.	N.	Light breezes and pleasant; latter part, squally with rain.
6	27 33	26 49	143				N. by E.	N. by E.	N. by W.	Light breezes and pleasant.
7	26 24	27 12	84	30.12	80	80	N. N. W.	S. E.	N. N. E.	Squally with rain; ends, light breezes and clear.
8	24 19	28 47	128	30.11	78	78	E.	E. N. E.	N. N. E.	Light breezes and pleasant.
9	22 18	30 20	156	30.10	76	76	N. by E.	E. N. E.	N. N. E.	Light breezes and pleasant; latter part, showers of rain.
10	21 11	32 21	149	30.10	79	79	N. N. E.	E. N. E.	N. E.	Light variable winds and pleasant.
11	19 53	33 24	207	30.10	79	79	N. E. by E.	N. E. by E.	N. E. by E.	Moderate breezes and pleasant.
12	12 31	34 37	280	30.00	76	76	E.	E.	E.	Fresh and cloudy.
13	9 37	34 17	196	30.00	76	76	E.	N. N. E.	E.	Moderate and cloudy; ends, squally with rain.
14	7 03	34 22	141	29.90	82	82	E.	E.	S. E.	Light and pleasant.
15	4 50	35 20	152	29.90	83	82	S. E.	S. E.	S. E.	Fine weather.
16	3 14	37 25	166	29.95	85	84	S. E.	E. S. E.	E.	Light winds and clear.
17	2 20	39 05	99	30.00	89	87	E. N. E.	E. N. E.	E. N. E.	Calm and squally, with light rain.
18	1 46	40 00	61	30.00	89	89	E. N. E.	N. N. E.	Calm	Light breezes and squalls.
19	0 48	40 37	98	30.00	89	89	Variable	E. N. E.	Variable	Calm, with passing squalls of rain.
20	0 49 N.	42 22	77	30.10	90	88	N. N. E.	N. N. E.	N. N. E.	Light airs and sultry.
21	1 21	41 18	53	30.10	90	90	N. N. E.	S. E.	Calm	Light airs and passing clouds, with rain.
22	2 42	42 42	106				Calm	N. N. E.	N. N. E.	Calms and squalls.
23	5 34	45 15	237	30.14	85	85	N. E. by N.	N. E.	W.	Fine breezes with occasional squalls.
24			293				N. N. E.	N. N. E.	N. N. E.	Fine breezes.
25	13 20	52 23	285							Fine breezes and fine weather.
26	16 10	54 55	282	30.15	85	85	E. N. E.	E.	E.	Fresh breezes and pleasant.
27	19 42	59 02	286	30.12	86	85	E.	E.	E.	Strong breezes and passing clouds.
28	23 21	61 35	273	30.00	83	83	E.	E.	E.	Pleasant breezes, with a rough sea.
29	26 00	62 40	188	30.15	86	86	E. S. E.	W. ½ S.	S. E.	Light breezes and pleasant.
30	28 10	64 00	153				S. E.	S. E.	S. E.	Commences pleasant; ends rainy, thick weather.
May 1	29 53	68 03	196	30.00	77	77	S. E.	N. E.	N. N. E.	Moderate breezes and thick, rainy weather.
2	31 43	71 26	199	30.12	68	71	N. by E.	N. N. E.	N. N. E.	Pleasant, with passing clouds.
3	33 13	73 26								Weather cool and pleasant.
4	34 32	71 47								Commences calm; ends with moderate breezes.
5	37 22	74 35								Moderate breezes; sounded in 40 fathoms; bottom.
6										Made Barnegat light at 1 A. M.; took a pilot on board, and stood in; at 3 P. M., anchored in East River.

STEAM ROUTE TO CAPE OF GOOD HOPE AND AUSTRALIA.

The exigencies of trade and travel will probably call for two steam routes, besides one *via* Panama Railway, to Australia. One of these will probably be direct, the other *via* the Cape of Good Hope. The direct route, using steam to cross the calm belts, and elsewhere only as an auxiliary, will be nearly the same as that for sailing vessels, except that they may cross the equator further to the eastward than I have recommended for canvas alone.

But as for the route *via* the Cape, no one who has coasted along in the Pacific, from Valparaiso to California, or any of the *intermedios*, can have failed to remark how beautifully adapted that sea is for steam navigation. Through the whole range, from north to south, of both systems of trades, that coast lies under the lee of a continent; hence the smooth sea and inviting field for steam. In like manner, the coast of Africa is a breakwater for the Atlantic; and under the lee of that continent it affords a smooth sea all the way between the tropics for steamers that ply between Europe and the Cape of Good Hope. The best course for such is by long stretches from headland to headland, taking care not to turn out of the way to follow the indentations of the coast.

The route taken from Liverpool to the Cape by Lieut. Porter, in the American steamship Golden Age, may serve as a model. His letter and remarks appear to present the way in so clear a light, that I deem it unnecessary to say more.

Abstract Log of the American Steamship Golden Age (D. D. PORTER, U. S. N.) *From Liverpool to Cape of Good Hope.*

Date.	Latitude.	Longitude.	Dist.	Current per hour.	Variation observed.	Density by hydrometer.	Bar.	THER. 9 A. M. WATER. Surface.	Depth.*	Air.	WINDS. First part.	Middle part.	Latter part.
1853													
Dec. 6	51°31′ N.	6°35′ W.	200								N. E.	N. N. W.	N. N. W.
7	48 59	9 52	240			1.029	30.10	57°	59°	54°	North	Calm	South
8	45 31	12 28	240			1.027	30.2	57	57	54	S. E.	S. E.	S. E
9	41 38	14 30	260			1.029	30.2	57	61	56	E. S. E.	E. S. E.	E. S E.
10	37 38	15 38	255			1.029	30.1	60	61	60	S. E.	Calm	North
11	34 04	17 10	220			1.029	30.0	63	64	65	N. N. W.	S.W.byS.	West
12	31 07	18 44	195			1.029	30.5	65	66	69	W. S. W.	W. by S.	W. by S.
13	27 41	20 11	240			1.029	30.2	70	71	76	W. S. W.	W. S. W.	W. S. W.
14	23 50	21 56	263			1.030	30.3	70	71	70	W. S. W.	N. W.	North
15	19 46	23 55	276			1.030	30.2	74	75	74	N. E.	N. E.	N. E.
20	14 30	24 15 D. R.	157	$1\frac{1}{2}$ k., W.		1.029	30.1	73	74	74	East	East	East
21	12 15	20 53	245			1.028	30.1	76	79	72	East	E. N. E.	E. N. E.
22	9 51		237		†	1.025 / 1.023	30.1	78	78	77	E. N. E.	E. N. E.	E. N. E.
23	7 18	14 39	235	$\frac{1}{2}$ k., W.	†	1.025	30.1	83	84	81	East	S. E.	East
24	5 08	11 31	237	$\frac{1}{2}$ k., W.	†	1.025	30.1	82	83	82	N.E.byN.	N. N. E.	N. E.
25	2 44	8 18	242			1.026	30.1	82	83	83	S. S. W.	S. S. W.	S. S. W.
26	0 40	5 09	230	$\frac{1}{2}$ k., W.		1.027	30.1	82	82	80	S. S. W.	S. S. W.	S. S. W.
27	1 36 S.	2 21	230	$\frac{3}{4}$ k., N. W.		1.027	30.1	81	82	83	S. S. W.	S. S. W.	S. S. W.
28	4 21	0 03 E.	220	1 k., N. W.		1.027	30.1	78	79	80	S. by W.	S. S. W.	S. by W.
29	7 10	3 12	251	$\frac{1}{2}$ k., E. by S.	24° W.	1.028	30.1	79	80	78	S. by W.	S. by W.	South
30	10 05	5 48	260	$\frac{1}{2}$ k., E. by S.	24° W.	1.028	30.1	79	80	78	S. by W.	S. by W.	South
31	14 16	7 54	255	$\frac{3}{4}$ k., E. by S.		1.029	30.08	72	71	74	S. by E.	South	S. by W.
1854													
Jan. 1	17 46	9 56	240			1.030	30.08	72	74	68	S. by W.	South	South
2	21 42	11 28	250	$\frac{1}{2}$ k., S. E.		1.029	30.1	68	67	69	S. by W.	South	S. by W.
3	24 56	13 09	220	$\frac{1}{4}$ k., S. E.	26° W.	1.029	30.5	66	67	68	S. by W.	S. by W.	S. by W.
4	28 06	15 11	212	$\frac{3}{4}$ k., S. E.		1.029	30.0	60	62	60	S. by W.	South	South
5	31 34	16 28	223	$\frac{1}{4}$ k., S. E.	26° W.	1.029					S. by W.	S. S. W.	

* Height of depth-cock from water-line 9 feet, ship lightening nearly 2 inches a day. On the last day of the voyage, cock $5\frac{1}{2}$ feet under water.

† Passing the mouths of the rivers Senegal, Gambia, and Icba, causing, I presume, the sudden change in density.—D. D. P.

Dec. 6. Going down St. George's Channel; all sail set.

Dec. 7. Begins light breezes; middle, calm; ends light; ship very deep.

Dec. 8. Begins light breezes; middle, light winds; ends the same.

Dec. 9. Begins strong breezes and cloudy; middle, strong winds; ends fresh breezes.

Dec. 10. Begins strong breezes; middle, heavy rain squalls; ends with fresh gales.

Dec. 11. Begins strong winds; middle, fresh gales, heavy rain squalls; ends with fresh gales. In looking at Maury's Chart, I find but one or two instances of S. W. gales in this lat.

Dec. 12. Begins fresh gales; middle, the same; ends fresh breezes.

Dec. 13. Commences fresh breezes; middle, the same; ends the same.

Dec. 14. Commences light winds; middle, the same; ends the same.

Dec. 15. Begins moderate; in the middle part anchored in the harbor of St. Vincent, Cape de Verds, 10 days 8 hours from Liverpool; met with the N. E. trade only in the last 24 hours.

Dec. 20. At 8 o'clock, P. M. on the 19th, sailed from St. Vincent, 900 tons of coal on board. Middle part, fresh breezes; latter part, moderate; in the last 12 hours found the current setting to the W. 1½ knots per hour.

Dec. 21. Begins light breezes; middle, fresh breezes; ends moderate.

Dec. 22. Begins light breezes; middle, fresh breezes; ends fresh.

Dec. 23. Begins fresh breezes; middle, light winds; ends variable and light; from 6 to 8 A. M. strong tide rips setting E.; from 10 A. M. to noon, strong tide rips setting E.

Dec. 24. Commences moderate breezes; middle, light winds; ends light airs.

Dec. 25. Commences light breezes; middle, strong breezes; ends fresh breezes and rain squalls. The wind seems to have set in steady to-day from S. S. W., the sails drawing beautifully, the thermometer standing at 82° in the shade, the weather cool and comfortable, and no one suffering in the least from heat. At noon, we were up with Cape Palmas, at which point the coast of Africa runs east from the wind harbor to S. W. by S. ½ S., evidently influenced by the land. This would enable a sailing vessel to lay along the land with a free wind, and make six or seven knots an hour. I found, as we approached the land, that the wind freshened, and died away as we left it.

Dec. 26. Begins fresh breezes and squally; middle, fresh and clear; ends strong breezes and squally; the jibs set, and at times the trysails; weather cool and pleasant; thermometer 85° in the shade; all fore-and-aft sail set; in the latter, ship making eleven knots.

Dec. 27. At 12 o'clock, wind quite light; middle, the same; latter part, fresh, hauling steadily to the south; water very smooth; found a current of one mile per hour setting to N. W.; night sets in with heavy, black clouds, but clears up finely by midnight.

Dec. 28. Begins strong breezes; middle, fresh breezes and hazy; ends fresh breezes.

Dec. 29. Begins fresh breezes; middle, fresh breezes; ends the same; wind moderating; water very smooth; at times, strong tide rips, which induced me to think we should have but little current, as I have noticed in the Florida Gulf that the current don't run so strong when there are tide rips; we found this

day ten miles easterly current; as we approach the African coast wind moderates; all the yards and masts down; steaming rapidly.

Dec. 30. Begins light breezes; middle, moderate; ends light; but one shower has occurred up to this time during our passage across the line, and no calm weather; since we fell in with the S. E. trades, the barometer has gone up .6 every night, and fallen to .3 in the day time.

Dec. 31. First part, moderate; middle, the same; ends the same; sea as smooth as a river; ship making eleven knots an hour; found no current; ship making her course and distance; strong tide rips; during the night, water very phosphorescent; looked like breakers.

January 1, 1854. First part, fresh breezes; middle, the same; ends light breezes; a heavy swell setting from the south; at 5 o'clock A. M. made light-colored water; at meridian, the day before, I shaped my course to go between Cape Frio and the bank of Antonio Viana, the latter laid down as doubtful on some of the Charts; passed 25 miles to the eastward of it; finding the water changing color to a light green, got an up down cast of the lead in 75 fathoms; mud and dark sand, also mark of a pebble; water growing lighter up to meridian; no doubt this is the eastern edge of the bank of Antonio Viana; found no current; sea calm, with a long swell; passed a hump-backed whale close aboard; many black fish in sight.

Jan. 2. Begins light winds; middle, moderate; ends fresh winds and rain showers; the first part of these 24 hours passing over light-colored water; a long ground-swell on; at midnight, the water suddenly became smooth, indicating that we were off the bank; wind setting in fresh; at 4 A. M. the breeze moderated a little, but set in again very strong, bringing fog and rain; current setting S. E.; water light colored again to-day, indicating soundings.

Jan. 3. Very strong winds from the S. E., and a very heavy head sea; found a current of 14 miles in our favor these 24 hours; water a light color, indicating soundings; short chopping sea on; weather clear and pleasant.

Jan. 4. A very strong trade blowing throughout these 24 hours; in the middle part it was very strong and squally; moderated a very little towards noon; a very heavy swell on; ship pitching into it hard; at midnight, got into blue or dark colored water; sea increased; hauled in on soundings by the appearance of the water; sea at once became smoother; coal getting short, allowanced the engine 25 tons per day; shut off close; no perceptible current these 24 hours; passed to-day tops of the palm tree floating on the water; running all day in light-colored water; coast 30 miles off.

Jan. 5. Strong winds these 24 hours from S. E.; a very heavy, short, head sea on, indicating current in our favor; found 20 miles of current with us this day; and without doubt there is a regular S. E. set on soundings where we have been for six days, for the current seems to run the stronger when the wind blows against it; this current commences in latitude 10° south, and, by hugging the shore, can be carried up to the Cape of Good Hope; from Antonio Viana bank, there are soundings all the way to the Cape, the water of a light green color; I got bottom in 75 fathoms, where the water first began to change; at midnight, made the table land, Cape of Good Hope, and stood into the harbor, twenty-six days and a half, running time, from England.

D. D. PORTER.

CAPE OF GOOD HOPE, *January* 6, 1854.

DEAR SIR: I inclose you a copy of the abstract log I have kept since leaving Liverpool; it may be interesting, from the fact that an American steamship has made a direct run to the Cape of Good Hope in 26 and a half days, the quickest run ever yet made by seven or eight days, and contrary to the opinion of many persons, who imagined that it could not be done by steam alone. I send you a little sketch of our course, which will show you at a glance the route I took; in studying your Wind and Current Chart, I found there was a region by crossing in 3° or 4° west longitude, where I would find steady S. W. winds, and another in east longitude where I would find calms; I also surmised that by running along the African coast (without deviating too much from my direct course), I would find an eddy current setting to the southeast: it turned out as I anticipated, and found to my entire satisfaction, that this was the true route for a paddle-wheel steamer, either from England or the United States. A fast steamer can make the run in 23 days from England, and 33 from the United States; and if a coal "depot" could be established at Goree (on the coast of Africa), the distance from England would be shortened 300 miles. I am told that Goree is a capital harbor, and as our interests in the East are multiplying daily, and at times it becomes important to get a steamship out there with dispatch, the matter is worth looking into.

The English steamers have so far in their numerous voyages (with one exception) to the Cape of Good Hope, met with very great ill luck, because they kept too far from the African coast, right in the strength of the trade-winds, with a strong current against them, and they have either had to put in somewhere short of coal, or else work their way across the S. E. trades, until they fell in with winds to help them to the Cape; in all of which cases they made very long passages, seldom being under 45 days, and sometimes as long as 55; all the side-wheel steamers that have gone out, have made the passage partly under sail; whereas, by taking the inshore track they would have made it in half the time with steam alone. I am pleased that we have solved the difficulty, and I am indebted entirely for my success to the hints I took from your Wind and Current Chart; it is as useful for steamers as it is for sailing vessels. I have been most agreeably surprised in not finding strong currents against me; indeed, since crossing the line, the current has been little or nothing, and mostly with us 12 or 14 miles a day; there may be such a thing as northerly set of current, but so far I have not met it, although since leaving the lat. of 24° south, I have had fresh S. E. trade-winds. I recommend this route to our steamers of war; they ought to be able to carry 30 days coal, which would allow them to push through; if they cannot carry that amount, they are unfit for war purposes.

I left England with a heavy freight on board, and twenty days coal (not so much as I actually required), consequently I was obliged to be prudent. I shut off four of my furnaces, using only two-thirds of my steam, and limited the engine to thirty-five tons a day, and the latter part of the voyage to much less; this is a small amount of coal for a ship of 3,000 tons, but when not troubled with currents, we managed to get through 250 miles a day, and averaged during the voyage 244. If I had marked out the weather for a steamer (with the exception of six days hard steaming against the trades), I could not have had it more to my mind, and I imagine it will be found the same nearly throughout the year.

I find little or no information to be depended on, relating to the currents on the African coast; I have kept a faithful account of them since leaving the Cape de Verd Islands, and you may find them worth recording; they are marked in the abstract wherever they occurred. You will see by my track that I made a course into the coast; this I did to get the in-shore current, as I found the current against me, or rather to the westward in long. 4° west; when I got in 5° east, I was out of its influence, and soon fell in with a southerly set.

I send you in the abstract log, the register of our hydrometer, with the density of water taken every day; it has been kept by Dr. Raymond, the intelligent surgeon of the ship, who takes great pleasure in such matters, and who will keep you supplied with such information when opportunities occur.

In conclusion, I would recommend for all steamers coming this route, to take at Cape de Verds, or Goree, all the coal they can possibly stow below and on deck, to allow for pushing through some very strong S. E. winds they will encounter after leaving lat. 24° S.; also to send down all yards, and masts, after crossing the equator, keeping the fore-and-aft sails to catch the S. W. winds, which up to 24° sometimes blow after sunset; also to keep the ship trimmed by the stern for the heavy head seas, and depend upon it you will hear of some very quick passages to the Cape.

I remain yours very truly,

DAVID D. PORTER.

LIEUT. M. F. MAURY,

Superintendent of the Observatory, Washington City.

From the Cape, the Golden Age made the run in 38 days to Port Philip, stopping by the way at King George's Sound, to coal. She kept between the parallels of 37° and 39°, and ran 6,050 miles during the trip. Now, in coming out from the cape, had she steered for the point of intersection of 60° E. with the parallel of 46°, thence along that parallel to 110° E., and thence for Port Philip, she would have saved about 400 miles. Supposing that steamers may not wish to stop for coal, it is matter of discretion with the master of each to decide as to his route. If he take the southern route, he will have the "brave west winds," with a rolling sea, after him. If he take the route upon the parallel of 38–9°, he will have a smoother sea, better weather, and a longer run. The question, therefore, as to route, is for the decision of the master, and not of the hydrographer.

Abstract Log of the Steamship Golden Age (D. D. PORTER). *From the Cape of Good Hope to Australia.*

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Bar.	Ther. 9 A. M. Air.	Water. Surface.	Water. Depth.	Specific gravity.	Winds. First part.	Winds. Middle part.	Winds. Latter part.
Jan. 17	35°45′ S.	21°00′ E.	1, N. by W.	30.00	71°	69°	70° P. M.		N. W.	West	S. W.
					71	69	70 A. M.				
18	37 40	24 26	1, N. by W.	30.00	67	75	76 P. M.		S. W.	E. S. E.	North
					71	73	74 A. M.				
19	38 33	29 45		29.00	70	66	67 P. M.	1028	N. by E.	West	West
					70	56	57 A. M.	1029			
20	38 34	35 19		30.05	62	62	63 P. M.	1029	West	West	W. by N.
					64	62	61 A. M.	1029			
21	38 11	40 43	¼, E.	30.00	63	62	63 P. M.	1029	West	W. S. W.	W. by S.
					66	66	67 A. M.	1029			
22	38 30	45 41		30.15	61	56	57 P. M.	1029	South	South	W. N. W.
					69	63	64 A. M.	1029			
23	38 55	50 31	½, E.	30.00	67	63	64 P. M.	1029	West	W. N. W.	W. N. W.
					68	64	62 A. M.	1028			
24	39 20	57 03	½, E.	30.08	67	62	63 P. M.	1029	West	N. W.	N. N. W.
					73	61	63 A. M.	1028			
25	39 28	62 38		30.10	66	61	62 P. M.	1029	W. S. W.	N. N. E.	N.E. by E.
					75	62	64 A. M.	1028			
26	39 36	68 07	¼, E.	30.06	65	62	63 P. M.	1029	N. E.	N. E.	N. E.
					68	62	63 A. M.	1029			
27	39 47	73 43	1, E.	30.80	67	58	60 P. M.	1029	N. E.	Calm	N. E.
					58	61	62 A. M.				
28	40 33	79 17	½, E.	29.85	67	62	63 P. M.	1029	N. E.	North	S. W.
					67	58	59 A. M.	1029			
29	40 33	85 11	1, E.	30.60	62	59	60 P. M.	1029	S. W.	S. S. E.	S. E.
					62	60	58 A. M.	1029			
30	38 37	91 09	1, E.	30.60	64	62	61 P. M.	1029	East	North	North
					68	60	61 A. M.	1028			
31	38 21	97 30	1, E.	30.8	64	59	60 P. M.	1029	S. by E.	North	North
					66	61	60 A. M.	1029			
Feb. 1	38 48	103 32	1, E.	30.6	64	62	62 P. M.	1029	N. N. E.	N. N. E.	N. N. E.
					64	58	60 A. M.	1029			
2	37 56	109 03	¾, E.	30.10	59	58	60 P. M.	1030	S. by E.	S. E.	East
					63	59	61 A. M.	1029			
3	37 49	114 27	½, E.	30.11	64	61	62	1029			
								1029			
9	36 26	121 52		30.10	61	64	65	1029	E. S. E.	S. E.	E. by S.
10	37 18	126 38		30.30	66	63	64 P. M.	1029	E. S. E.	S. E.	S. E.
					66	63	64 A. M.	1029			
11	38 19	131 48	½, E.		60	61	62 P. M.	1029	E. S. E.	East	East
					65	61	62 A. M.	1029			
12	38 44	137 39	½, E.		62	62	63	1029	S. E.	S. E.	S. E.
								1029			
13			½, E.					1029			

Jan. 17. At 2 P. M. got under way from anchorage in Table Bay, and proceeded to sea; twelve hundred tons of coal on board; first part, light breezes; middle part, fresh breezes and squally; latter part, light breezes and passing clouds; set the fore-and-aft sails, and sent up all masts and yards; bent every sail in the ship ready for setting. Distance run, 205 miles.

Jan. 18. Commences with fresh breezes and passing clouds; middle part, light, variable winds; latter part, light breezes and pleasant. Distance run, 210 miles.

Jan. 19. Begins with fresh breezes and clear weather; middle part, fresh breezes; latter part, light breezes; all sail set, at times. Distance run, 255 miles.

Jan. 20. Commences with pleasant breezes and clear weather; middle part, fresh and steady breezes; latter part, strong winds and cloudy; all sail set, low and aloft. Distance run, 265 miles.

Jan. 21. Begins with strong winds, and squally; middle part, the same, with a very heavy sea; latter part, strong winds and sea increasing; carrying all sail. Distance run, 256 miles.

Jan. 22. Commences light winds and pleasant; middle part, the same; latter part, the same; all sail set. Distance run, 240 miles.

Jan. 23. Commences with fresh breezes and passing clouds, with rain squalls; middle part, moderate breezes, and rain at intervals; latter part, light winds and pleasant weather; all sail set; heavy sea. Distance run, 305 miles.

Jan. 24. Commences with moderate breezes and passing clouds; middle part, light winds, heavy clouds, and rain squalls; latter part, light winds and cloudy, with rain at intervals; all sail set. Distance run, 293 miles.

Jan. 25. Commences light airs and pleasant weather; middle part, light winds and heavy weather, with rain; latter part, variable winds; a heavy sea rolling in from the N. W. Distance run, 255 miles.

Jan. 26. First part, light breezes and fine weather; middle part, the same; latter part, the same; all sail set; a heavy sea from N. W. Distance run, 272 miles.

Jan. 27. Commences with light breezes and cloudy; middle part, fresh breezes and cloudy; latter part, strong winds, with rain; all sail set. Distance run, 290 miles.

Jan. 28. Commences with strong winds and squally weather; middle part, the same; latter part, strong winds and thick weather, with squalls; a tremendous sea rolling in from N. W. Distance run, 275 miles.

Jan. 29. Commences with fresh breezes and cloudy weather; middle part, moderate breezes, and pleasant; latter part, strong winds and squally weather; a heavy sea setting from N. W.; ship going at a rapid rate; every sail set. Distance run, 280 miles.

Jan. 30. Commences with thick, cloudy weather; blowing half a gale; middle part, the same, with heavy squalls; latter part, strong breezes and cloudy; ship increasing her speed; every sail set. Distance run, 310 miles.

Jan. 31. Commences strong breezes and clear weather; middle part, fresh breezes and clear weather; latter part, the same; all sail set; ship travelling rapidly. Distance run, 300 miles.

Feb. 1. Commences fresh breezes and fine weather; middle part, the same; latter part, strong winds and thick weather; all sail set; ship travelling rapidly. Distance run, 297 miles.

Feb. 2. Commences with strong winds and thick, rainy weather, with heavy squalls and tremendous

cross sea; had to run the ship off at times to save the sails and ease her over the sea; middle and latter parts, the same; in the latter, wind ahead and all sail in. Distance run, 270 miles.

Feb. 3. Commences with strong winds and thick, foggy weather; middle part, fresh breezes and cloudy; latter part, light wind and thick weather. Barometer and other appearances indicating an easterly gale, and coal getting short, shaped the course for King George's Sound, where we had a supply. Distance run, 260 miles.

Feb. 4. Commences with light winds and clear weather; middle part, light winds and clear weather; latter part, moderate breezes; at 7 h. 30 min. made Bald Cape right ahead; passed in shore of all the reefs, which I found laid down very correctly on the chart (Flinder's); at meridian, anchored in the inner harbor of King George's Sound; commenced taking coal from two ships. Distance run, 250 miles. At 10 A. M. anchored in King George's Island.

Feb. 9. Begins with strong gales from the eastward; went to sea at meridian; middle part, fresh gales; latter part, fresh gales, and a heavy head sea. Distance run, 200 miles.

Feb. 10. Commenced heavy head sea and fresh gales; middle and latter parts, the same.

Feb. 11. Commenced strong winds and clear weather; middle part, strong winds and cloudy, thick weather; latter part, the same; a heavy head sea.

Feb. 12. Commences moderate and cloudy; middle part, moderate weather and thick, with rain; latter part, the same, with heavy head sea.

Feb. 13. Commences with light winds and beautiful weather; middle part, the same; latter part, fresh breezes and pleasant; at 9 A. M. made the coast of Australia; at 10 h. 30 min. made Cape Otway lighthouse; at 12, abreast the cape, two miles distant; at 6 h. 30 min. made Port Philip Head; took on board a pilot, and anchored inside the Heads.

FROM AUSTRALIA TO PANAMA.

A line of steamers is about to be established between Panama and Australia; the Golden Age is the first steamer that has made a trip between the two places, and it therefore may be of some interest, and possibly of advantage, to those who are to follow, to have for their guide the track of such a clever navigator as is my friend Porter of the navy; though it may be well to remark that the Society Islands are out of the way as a mere coaling station. For the route *from* Australia (Melbourne), the nearest way is south of New Zealand, and thence *via* great circle north of Easter Island. For the route *to* Australia, perhaps on account of winds and weather, and other considerations, the Society Islands may be found the most convenient touching place.

Abstract Log of the Steamship Golden Age (D. D. PORTER). *From Sydney, Australia, to Panama, via Tahiti,* 1854.

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	Variation observed.	Bar.	Ther. 9 A. M. Air.	Water. Surface.	Water. Depth.	Spec. gr.	Winds. First part.	Winds. Middle part.	Winds. Latter part.
May 12	31°28′S.	156°40′ E.	½, S.	10° E.					1028	S. W.	W. S. W.	W. S. W.
13	31 26	159 40	½, S.	10					1028	South	W. S. W.	W. S. W.
14	29 59	163 40	½, S.	10	29.80	63°	66°	72°	1028	West	E. S. E.	E. S. E.
15	28 59	167 22	½, S.	10	29.65	68	69	70	1028	E. N. E.	N. E.	N. N. W.
16	27 51	172 16		10	29.60	71	72	72	1028	N. N. W.	N. N. W.	N. W.
17	26 32	176 55		10	29.50	72	70	71	1028	N. W.	S. S. W.	S. S. W.
17	25 39	178 38 W.		9	29.60	69	72	71	1028	S. S. W.	S. S. E.	S. S. E.
18	24 24	174 15	1, W.	8	29.60	70	74	73	1028	S. E.	S. E.	S. E.
19	23 42	169 05		8	29.60	75	79	78	1028	S. by W.	S. by W.	S. by W.
20	22 40	164 46		7.50	29.60	70	74	74	1028	South	S. E.	S. S. E.
21	21 16	160 33	¼, W. S. W.	7.50	29.60	75	73	74	1028	S. E.	S. E.	S. E.
22	20 36	156 32	½, W. S. W.	7.50	29.60	75	77	78	1028	S. E.	E. S. E.	S. E.
23	19 18	152 45	1, W. S. W.	7	30.10	76	78	79	1028	E. S. E.	E. S. E.	E. S. E.
31	16 45	145 42	1½, W.		30.05	79	80	81	1028	E. N. E.	East	E. ½ S.
June 1	15 27	143 04	½, W.	6	30.10	82	81	82	1028	East	East	East
2	14 24	139 23	½, W. S. W.	6	30.05	80	83	83	1028	E. N. E.	E. N. E.	E. N. E.
3	13 11	136 10	1, W. S. W.	6	30.10	82	82	83	1028	N. E.	N. N. E.	N. E. & E. N. E.
4	11 56	132 32	½, W. S. W.	6	30.15	84	82	*	1028	E. N. E.	E. N. E.	E. N. E.
5	10 29	129 14	1, W. S. W.	6	30.10	81	81	82	1028	E. N. E.	E. N. E.	E. N. E.
6	9 13	125 46	1, W. S. W.	6	30.05	80	82	82	1028	E. N. E.	E. N. E.	E. N. E.
7	7 53	122 10	½, W. S. W.	6	30.10	81	81	82	1028	E. N. E.	E. N. E.	E. by N.
8	6 16	118 46	½, W. S. W.	6	30.15	80	82	82	1027	E. N. E.	East	E. by S.
9	4 45		2½, W. S. W.	8	30.10	81	81	82	1026	E. by S.	S. E.	S. E.
10	3 17	112 01	1, W.	8.20	30.10	77	80	80	1027	S. E.	S. E.	S. E.
11	2 02	108 34	1, W.	8.20	30.10	78	77	78	1027	S. E.	S. E.	S. E.
12	0 47	104 41	1, W.	8.20	30.10	74	78		1027	S. E.	S. E.	S. E.
13	0 49N.	101 06	1½, W.	8.20	30.20	78	75	76	1027	East	E. N. E.	S. E.
14	2 13	98 00	2¼, W.	8.40	30.10	77	76	76	1026 1025	South	South	South
15	3 30	94 10	1, W. by S.	8	30.10	80	79	80	1025 1025	S. by E.	S. by E.	South
16	4 15	89 53		8	30.10	80	81	81	1025	S. by E.	S. by E.	S. S. W.
17	5 50	85 40		8	30.10	81	81	81	1024	S. S. W.	S. W.	N. E.
18	6 32	80 40		8	30.10	80	82	82	1024	Variable	Variable	S. S. W.

May 12. Commences with moderate breezes and fine weather from the S. W.; at 1 P. M. made all sail; middle part, brisk breezes from S. W., with a heavy beam sea; latter part, the same; ship very deep and rolling heavily, an unusual thing for her; distance run, 225 miles.

May 13. Commences with fine weather and moderate breezes from the south with a heavy beam sea; middle part, light breezes from S. W.; latter part, pleasant breezes and fine weather from the N. W.; at meridian, Howe's Island bore E. by S. distant 20 miles, by observation, and by comparison with other charts found it laid wrong in latitude on Blunt's Chart 64 miles too far south; distance run, 225 miles.

* Not taken.

May 14. Commences with brisk breezes and pleasant weather from the north; at 5 P. M. squalls of wind and rain from the north; middle part, light breeze and fine weather; ends the same; distance run, 225 miles.

May 15. Commences with light airs and fine weather; middle part, pleasant breezes and fine weather; latter part, moderate breezes; at 11 A. M. made Norfolk Island, distant 30 miles, bearing E. by N.; distance run, 225 miles.

May 16. Commences light breezes and fine weather; at 3.10 P. M. Mount Peth bore by compass S. by W. distant 3 miles; chronometer agreeing with bearing by observation; strong tide rips; middle part, light breeze; latter part, fresh breezes and squally; made all sail, sea getting up; distance run, 270 miles.

May 17. Commences with light winds and rain; middle part, moderate breezes and light rain; latter part, fresh breezes and fine weather; under all sail and steam; distance run, 264 miles.

May 17. Commences fresh breezes; middle part, fresh breezes and heavy rolling sea; ends the same; distance run, 280 miles.

May 18. Commences light breezes and cloudy; at 4 furled all sail; middle part, light variable winds and cloudy; latter part, light breezes from the south; distance run, 241 miles.

May 19. Commences with moderate breezes from the S. W.; at 2.40 spoke an English whale ship from Feejee Islands; middle part, light breezes and fine weather; latter part, fresh breezes from S. E. and pleasant; distance run, 272 miles.

May 20. Commences with moderate breezes from the south, and fine weather; at 5 P. M. wind S. E.; took in all sail; middle part, fresh breezes and cloudy; latter part, moderate; distance run, 267 miles.

May 21. Commences with moderate breezes and pleasant weather; middle part, fresh breezes and cloudy; latter part, strong breezes and squally weather from E. S. E.; distance run, 241 miles.

May 22. Commences with strong winds from S. E. and squally weather; at 1 P. M. made the island of Rovobongen bearing E. by N. distant 25 miles; passed over the spot where Armstrong's Island is laid down; no such island exists; at 3 P. M. housed all the masts and sent down all the yards; wind and sea increasing; at 4.50 P. M. ran close in to the beach off the town of Rovobongen and saw a great many natives assembled; apparently a good bay for a ship to lie in; middle part, wind very strong and cloudy; latter part, strong winds and cloudy; distance run, 234 miles.

May 23. Commences with fresh breezes and squally weather; middle part, fresh gales and squally; latter part, fresh gales and squally; distance run, 222 miles.

May 24. Commences with strong breezes and heavy rain squalls; heavy sea; middle part, heavy squalls of rain; wind from all points of the compass; latter part, the same; at 7 P. M. made the island of Tahiti, bearing N. E. by E. distant 25 miles; strong tide rips; at times shut in by thick weather; at 11 took a pilot and anchored in the harbor and commenced coaling; at 4 P. M. three coal ships alongside.

May 31. Got under way at 12 o'clock; throughout the 24 hours light breezes, fine weather, and sea as smooth as a mill-pond; distance run, 200 miles.

June 1. Commences with light winds from the E., and fine weather; at 3.45 made the island of

Faaite (one of the Paumotu groups) ahead, distant 15 miles; found a strong current here from the east 2 miles an hour, which did not allow us to get up to the land until nearly sunset; middle part, clear and pleasant; latter, passed through the group of islands in the night and found them difficult to see, though we passed close to some of them. I found the passage I took to be a safe one; keeping a good look-out; and I think the most direct one, viz: between Faaite and Fakarawa; between Raraka and Katiu (a small island to the northward of Sea Gull groups, and not named on the chart), between Makemo and King's Island, and finally between Lukunea and Disappointment Island, which brought us out clear, with a current of one mile an hour to the W. S. W.; distance run, 224 miles.

June 2. Throughout these 24 hours, pleasant breezes from the eastward, and sea smooth as a mill-pond. Distance run, 220 miles.

June 3. These 24 hours, pleasant breezes; sea as smooth as a mill-pond. Distance run, 202 miles.

June 4. Light airs during these 24 hours. Distance run, 231 miles.

June 5. Light airs during these 24 hours. Distance run, 212 miles.

June 6. First part, brisk breeze; second, the same; latter part, pleasant breezes. Distance run, 220 miles.

June 7. First part, brisk breeze; second, the same; latter part, pleasant breezes. Distance run, 233 miles.

June 8. Commences with fresh breezes and beautiful weather; middle part, light breezes; latter part, fresh breezes. Distance run, 230 miles.

June 9. Commences with fresh breezes and beautiful weather; sea smooth as a river; middle part, wind light and variable; latter part, light breezes and pleasant. Distance run, 210 miles.

June 10. Commences with light breezes and fine weather; middle part, moderate breezes; latter part, the same; strong current, running to the N. W. Distance run, 242 miles.

June 11. Commences with light airs and beautiful weather; ship quite cool; middle part, moderate breezes; latter part, pleasant breezes; a strong current setting to the westward; fore-and-aft sails drawing well. Distance run, 240 miles.

June 12. Commences with fine weather and fresh breezes from the S. E.; middle part, the same; latter part, moderate breezes; fore-and-aft sails drawing; a long swell from the south. Distance run, 248 miles.

June 13. Commences with moderate breezes and fine weather; middle part, light breezes and cloudy for the first time since leaving Tahiti; latter part, brisk breezes and beautiful weather; a long, regular swell setting from the south. Distance run, 242 miles.

June 14. Commences light breezes and fine weather; middle part, fresh breezes; latter part, moderate. Distance run, 242 miles.

June 15. During these 24 hours, fresh breezes. Distance run, 200 miles.

June 16. These 24 hours, fresh breezes. Distance run, 260 miles.

June 17. Commences with fresh breezes; middle and latter parts, light and variable. Distance run, 257 miles.

June 18. Commences with variable breezes and rains; middle and latter parts, calms; at meridian, made Cape Mala, bearing N. by E., 40 miles. Distance run, 315 miles.

PANAMA, *June*, 1854.

DEAR SIR: I inclose you my abstract log from Cape of Good Hope to Australia—also the log from Sydney to Panama, *via* Tahiti; the latter, I know, will interest you as being the opening of the finest route in the world, and the most direct one from Australia to the United States by 40 days at least, and ten or twelve days shorter than the overland mail route to England—to say nothing of the climate and weather, which are beautiful beyond comparison. I could have made the entire distance from Tahiti to Panama in a jolly boat—so smooth has the ocean been. I found strong currents running to the westward an average of 24 miles per day, which I have carefully noted; a ship would make the voyage from Panama to Sydney in four days less time than from Sydney to Panama, on account of the trade-winds and currents. The ocean, from Tahiti eastward, is a quiet, lovely one; not a sail, a bird, or a fish, to be seen; nothing to break the monotony but tide-ripples, of which there are plenty.

This route will eventually (and very soon), be travelled by every one going to and coming from Australia—the gold dust will pour this way across the Isthmus of Panama, and rich goods in return will be going to Australia; if the Pacific Railroad is finished, the travel will be by that way; nearly all the Australians—of whom I bring 200—go by the way of New York; and most of our gold dust is to be shipped under the American flag, owing to the war in Europe.

I send you the run of this ship around the world. I may say—though we don't run quite as fast as clippers do at times, yet we keep up a steady pace, which counts in the long run; and we can't go full speed, as coal depots are not met with every day. Our performance, however, is the best on record.

			Days.	Hours.
From New York to Liverpool, deducting for difference of longitude	3,100	=	11	7
" Liverpool to Cape Good Hope	6,360	=	26	12
" Cape Good Hope to King George's Sound, Australia	4,930	=	17	12
" King George's Sound to Melbourne	1,270	=	4	20
" Melbourne to Sydney	560	=	00	43
" Sydney to Tahiti	3,421	=	13	12
" Tahiti to Panama	4,532	=	18	00
	24,173	=	93	15

which gives an average of 258½ nautical miles per day, or 298 English miles. The Golden Age has 16 furnaces, but has never used but 12 of them, and has always run under low steam to save coal; the only

time she ever used all her power (which was the last day going into Liverpool), she made 330 miles. Any particular information you may desire with regard to this route, I shall be happy to give you.

I remain yours, very truly,

D. D. PORTER.

P. S.—I sent you my log from Liverpool to Cape of Good Hope, from the Cape. Please inform me if you have not received it, and I will send a duplicate; it contains something that may interest you in the way of currents on the coast of Africa—besides being a route scarcely yet travelled, and never before by a steamer.

D. D. PORTER.

LIEUT. M. F. MAURY.

FROM CALIFORNIA TO VALPARAISO.

C. H. Wells, Acting Master U. S. N., has obtained from the Exchange, at Valparaiso, and sent me a list of the arrivals at that port from California during 1851 and 1852. In his letter accompanying this list he says: "In the course of two weeks, I will have another made out, for the years 1853 and 1854. There were no arrivals from Australia in 1851 and 1852, and it is only since the discovery of gold, that there have been any. I took it for granted that you would like to have as many arrivals as possible recorded, and therefore commenced from 1851, at which time Chili had a large flour trade with California; but of late it has much declined—indeed, it is predicted that California will soon drive Chili out of the market in that article. I also inclose you receipts for Charts and 'Sailing Directions,' which are always in demand. I could very easily distribute double the quantity, but I always give the preference to those who would be most likely to keep abstracts properly."

This list quotes 316 arrivals direct from San Francisco, giving the names of the vessels, and a passage of 62½ days on the average; the shortest passage, that of the Seaman, being 34 days; the longest, 122 days.

The average passage from California to Callao has been reduced to 56 days. In *time*, Valparaiso is nearer than Callao to California; for the San Francisco traders generally have to go south of Valparaiso to get to Callao. Hence, the passage to Valparaiso ought to be the shortest; and it can be easily reduced to less than 55 days on the average—I think to about 50—by any one who will study the Charts, and heed the directions at page 707 *et seq.* for the *western* passage from California to Callao.

The way to Valparaiso is the same as the way homeward around Cape Horn, until you get into the westerly winds of the southern hemisphere—then haul up for your port, and the way is plain.

SAILING DIRECTIONS FOR SANDY HOOK.

NAVY DEPARTMENT, *January* 8, 1855.

SIR: My attention has been called for the last few months to the numerous wrecks which have occurred near New York, and on the coast of New Jersey. They have been attended with not merely great loss of property, but with an intensity of suffering and a loss of life well calculated to excite our deepest sympathies. But I do not think we should be content with merely feeling and expressing these sympathies. It is creditable to the heart, but will afford no relief for the past, and no remedy for the future.

In reflecting upon this subject, I have deemed it proper to address you and inquire whether, in your opinion, something may not be done to arrest these dreadful disasters, and whether proper sailing directions exist?

The experience and successful devotion of Lieut. M. F. Maury, to subjects of this character, have attached no little importance to his views, and the department desires that a copy of this communication be enclosed to him, in order to obtain such suggestions and views as he may deem proper to make.

Any suggestions which you can make will be appreciated by the department, as the subject is one deeply interesting to government and people.

I am, respectfully, your ob't serv't,

(Signed) J. C. DOBBIN.

COM. C. MORRIS.

Chief of the Bureau of Ordnance and Hydrography.

BUREAU OF ORDNANCE AND HYDROGRAPHY, *January* 9, 1855.

SIR: Enclosed is the copy of a letter from the Secretary of the Navy, referring to the numerous wrecks of vessels upon the coasts of New Jersey and Long Island, and inquiring if something may not be done to arrest these disasters.

He also, as you will perceive from his letter, desires that you should present such suggestions and views on this subject as you may deem proper to make.

From the conversations and examinations which we have already had on this subject, I feel well satisfied that directions may be framed, and information be furnished, by which the dangers of approaching the entrance to New York in thick weather or at night may be materially diminished, if proper attention be given, and due precautions taken by masters of vessels.

The importance of the subject will, I have no doubt, command your early attention, and secure for the use of all persons interested, the best directions for avoiding losses of life and property on those coasts, which the circumstances of the case will allow.

Respectfully, your ob't serv't,

(Signed) C. MORRIS,

Chief of the Bureau.

Lieut. M. F. MAURY,

Sup't'n't U. S. N. Observatory, Washington.

U. S. Naval Observatory and Hydrographical Office, *January* 11, 1855.

Commodore Chas. Morris. Sir: I have received your communication of the 9th inst, enclosing a copy of one of the 8th, to the Bureau, from the Secretary of the Navy, in relation to the numerous wrecks that have occurred among vessels in approaching Sandy Hook, and the means for preventing them.

I have examined the subject with great care, and am happy to say that the results of the investigation encourage the belief that the way from sea to Sandy Hook can be made so plain to navigators, that any one who will heed caution and use the water thermometer and sounding lead may, without other guide, feel his way in perfect safety and in the thickest fog, to Sandy Hook, or at least so near to the entrance, that when the fog lifts he will have no difficulty in recognizing his position.

I know of no port, the approaches of which are better marked than those of Sandy Hook, by water and bottom, and for which the thermometer and lead are such sure, safe, and trusty guides; and I concur fully with you in the opinion that with the marks thus afforded, properly described and pointed out to navigators, there will hereafter be no sufficient excuse whatever for any one who may get his ship ashore in approaching Sandy Hook, unless she be forced there by stress of weather, or under circumstances which render precautions of no avail.

As long as a vessel is under control, the lead is in these offings a perfectly safe guide, and if, with a proper chart and sailing directions before him, any navigator shall find his vessel stranded either on the beach of Long Island or New Jersey, it will have been because he would not heed directions, nor use his lead, nor take those other simple precautions which it is the bounden duty of every shipmaster to observe, especially when approaching the land in doubt or the dark.

I have for several weeks been at work upon such a chart, with sailing directions to accompany it, but they will not be ready for publication for several weeks yet. The chart will cost about ten cents a copy; and it would, perhaps, be well to authorize the engraving of it in order to save time and hasten publication, for it is desirable to publish without delay.

Respectfully, &c.,

(Signed) M. F. MAURY,

Lt. U. S. N.

GENERAL ORDER.

Navy Department, *May* 1, 1855.

Commanding officers of vessels of the navy of the United States, who may be on that part of the coast embraced by the chart of the "Approaches to Sandy Hook," to which these directions refer, will cause frequent soundings to be carefully taken, and the depth of water and character of bottom to be entered on a copy of the chart, and they will forward the same to the Bureau of Ordnance and Hydrography by some early conveyance, accompanied by any remarks which they may deem useful.

CHAS. W. WELSH,

Acting Secretary of the Navy.

SAILING DIRECTIONS FROM SEA TO SANDY HOOK.

THE better to show what excellent and safe landmarks nature has afforded the navigator for making Sandy Hook and its lights, I have resorted to the expedient of a colored chart. Plate XXIII. has been constructed by Lieut. Porter and Professor Flye, who have for the purpose been furnished with the best data extant, which, though not as complete as I could wish, are nevertheless sufficient, in the main, to bring out the most striking of these marks with truthfulness enough to enable one readily to recognize them.

By coloring the bottom instead of shading the depth, the excellent character of the landmarks which are afforded by the *kind* of bottom, when taken in connection with the depth, becomes very striking.

The coast line, the soundings, and the bottom, are, on the authorities of the charts of the Coast Survey, entitled *General Chart of the Coast from Gay Head to Cape Henlopen*, published in 1852, and *Preliminary Sketch of Davis's South Shoal and other Dangers*, 1853, *et al.* Where these do not apply, the chart of E. and G. W. Blunt, entitled *The Coast of the United States, Sheet No.* 1, *from Point Judith to Cape Lookout*, 1854, has been consulted. The lights have for their authority the publications of the Lighthouse Board; and the in-shore limits of the Gulf Stream are projected according to data derived from the Wind and Current Charts of this office.

With all the information to be derived from these sources collected together and spread out on a chart before him, the navigator who uses the lead, keeps his run, and pays attention to the water thermometer, will not be in much need of written sailing directions. To such a one Plate XXIII. itself is sailing directions enough, for it shows that there are no hidden dangers to apprehend—that the leading marks make the way plain—and the log, lead, and look-out will not fail to point them out, and to certify him as to the position of his ship before she nears the land too closely.

As the navigator approaches the western shore of the Atlantic from any port beyond the Gulf Stream, he is or *may be* warned of the fact by the water thermometer. The inner edge of the Gulf Stream is, with rare exceptions, well marked. The eastern, or outer edge is not so well marked. But though the navigator may not be able always to say at what time his vessel entered the stream from the east, yet, when he gets well into it, he will generally have no difficulty in recognizing the fact. Being in it, he should, however good his chronometer and accurate his reckoning may be *supposed* to be, have frequent recourse to the water thermometer, for, by a little attention to it, he may often tell, within a few miles, when he leaves the inner edge of the stream, and enters the cold water between it and the shore.

Being thus put upon his guard, he has in the lead, and the lookout, and the water thermometer sure guides for conducting his vessel safely thence to the offings of Sandy Hook, and of placing her so near the entrance that when the fog lifts, or daylight appears, he will be in the fair way to port, and have no difficulty in recognizing his position.

I have traced in black and red, on Plate XXIII., the mean in-shore limits of the Gulf Stream, for the various months, and at different temperatures. Navigators, however, are cautioned not to regard these

limits as *fixed* lines, for they are fluctuating. Sometimes they are much nearer to the shore, at others farther from it than they are represented on the chart to be; but the lines there drawn show the average limits of the inner edge, traced with a free hand, from the mean of a great number of observations, which limits are near enough to the actual mean monthly limits to put navigators on their guard, for they should be on the lookout for the inner edge of the stream *always*, and for a considerable distance before they reach the position assigned to it on the chart.

Being warned by the water thermometer and the deep-sea lead that he is inside the Gulf Stream, or that he has passed the forty and the thirty fathom curve, and is nearing Sandy Hook, the lead should be kept constantly going, especially in the night, or foggy or threatening weather; by referring to the soundings, his rate of sailing, and Plate XXIII., the navigator will be certified still more surely as to the position of his vessel—for the approaches are shown on this chart to be so well marked by the kind of bottom, and the depth of water, that nothing but stress of weather or the utmost recklessness should hereafter be regarded either as cause or excuse sufficient for putting a vessel ashore there. She may have lost her reckoning, and the weather may be never so thick, still, the marks underfoot are so plain that she cannot, if her master will try them, get into any danger from the shore without his knowledge.

As one approaches Sandy Hook from seaward, and shoals the water to less than fifty or sixty fathoms, the bottom is either mud, ooze, or sand—that is, these are its chief characteristics. The mud or ooze may be blue, black, or green; or it may be mixed with sand; or the sand may be gray, white, or yellow, and be mixed with shells—broken or whole—or with specks, black or yellow. These colors, shells, and mixtures are disregarded in the construction of Plate XXIII. It gives only the predominating character of the bottom, sand and mud being colored as sand; mud and sand, as mud; thus recognizing the *main* features *only*. Sometimes there are well-marked patches of pebbles, gravel, or rocks; in such cases the chart is so delineated as to bring them out also, and to show where they are.

Between the shore and the twelve fathom curve, the *kind* of bottom is not given. This space is left blank, to warn navigators to keep out of it until they be certified by the lights, or other landmarks ashore, as to their position. There is some doubt, also, as to the kind of bottom in the neighborhood of Block Island, and thence towards the Nantucket Shoals, for the authorities do not give the kind of bottom there with sufficient distinctness to make my mind clear upon the subject. But that happens to be not very material to the purpose now in view, for this chart is only intended to illustrate the *approaches* to Sandy Hook FROM THE SEA, and it is presumed that no vessel from the sea will get upon the ground represented by this part of the chart without first crossing the Nantucket Shoals, or passing over muddy bottom, or recognizing some of the landmarks alluded to which will certify her as to position. There is a large space between these shoals and Block Island, in which there are no soundings, and in which I have *supposed* the bottom to be sandy, though for aught that the charts consulted show to the contrary, it may be mud.

Though the depth and bottom are given with as much accuracy as the present state of our information will admit, nevertheless a caution is necessary: navigators are not to suppose that the sand and the mud even in other parts of the chart where there is no want of soundings, are separated from each other as distinctly and sharply as the colors for mud and sand would indicate. The soundings, for a considerable

extent, are occasionally a mixture of sand and mud, and the change from all mud to all sand is often so gradual, and the dividing line is in some places so jagged and irregular, and at others even uncertain as to place, that it is difficult to say exactly where the mud ends and the sand begins. These dividing lines, therefore, it should be recollected, are not, by any means, as sharp as shore lines, nor are their positions as well determined; for they, like the forty, the thirty, twenty, and the twelve fathom curves, are necessarily drawn somewhat with a free hand.

Therefore, when the navigator, consulting this chart, finds his soundings to change from mud to sand, he is not to infer that he knows *exactly*, and to the very spot, where he is; but, on the contrary, he should proceed, even in the best certified cases, as though he had reason to doubt as to his position by several miles at least, and continue to feel his way cautiously until the rate at which he is shoaling his water, taken in connection with the course he has been steering, the distance he has run, or the mud-holes or the gullies which connect them, or the pebble or gravel banks which stand both as a beacon and fender to the Long Island and Jersey shore, or the lights, or the unmistakable landmarks ashore or at the bottom, make assurance doubly sure, and leave him no room to doubt where he is.

The navigator bound into New York is requested, before he reaches the offings of Sandy Hook, to make himself familiar with Plate XXIII. and its leading features; and, that he may do this the more readily, he will perhaps allow me to call his attention to a few more of the striking characteristics, that nature has placed as beacons at the bottom, to warn him of danger, and guide him safely where he would be.

THE 40, 30, 20, AND 12 FATHOM CURVES.—The 40 fathom curve, coming from the south and trending along with the Jersey shore pretty well, takes, upon reaching the parallel of Sandy Hook, a turn to the eastward, and runs off the chart where the bottom is very uneven.

The 30 fathom curve conforms more nearly with the Jersey and Long Island shore lines in its direction. Starting from the parallel of 39°, it runs along with the Jersey shore line until it approaches within 15 or 20 miles of the parallel of Sandy Hook. Here it turns to run irregularly with the Long Island shore line until Montauk Point is brought to bear northwest, where, in muddy bottom, it makes a turn east. After running some distance by irregular curves over muddy bottom, it dips down over sandy bottom to clear the Nantucket Shoals.

From Cape May to Barnegat, the water between the 20 and 12 fathom curves shoals so gradually that the depth is not a very good guide as to the distance from the shore, at least it should not be considered a nearer guide than 10 or 12 miles. Off Barnegat, the 20 fathom curve turns to the westward, gradually approaching the Jersey shore until it strikes that singular range of holes (they are shaded on the plate) which seem to be connected by a gully or channel-way—also shaded on the chart—not so deep as the holes, but deeper than the surrounding water. Here, at the distance of 24 or 25 miles due south from Hog Island Inlet, it turns and runs northeast towards Block Island, passing within 6 or 8 miles of Montauk Point, and so on above and beyond Block Island, where it becomes irregular, with sandy bottom all the way.

From Montauk Point, the 12 fathom curve runs along the shore until it gets off Fire Island Inlet;

here, making a bight, it runs close in with the beach, thence it gradually recedes until it gets 6 or 8 miles off from it. Turning in front of the entrance to Sandy Hook, it sweeps down inside of the light-boat, and runs very nearly along with the Jersey shore, which it gradually approaches—except where it makes another bight marked on the chart—until you reach the head of Barnegat Bay, where it is close in; it then gradually recedes until you approach Cape May, where it is 10 or 12 miles from the land.

It may be well to call the attention of navigators to these two bights in the 12 fathom curve. They are very close in, one off Fire Island, and the other off Squam Beach—the most famous places for wrecks. Do these two beaches owe their celebrity to this fact? Deep water so close in seems sufficient to explain why more vessels are lost at these particular places than elsewhere along the same shores. It is well, therefore, for the navigator to take warning, and make it a rule to feel cautiously along after getting in 15 fathoms, and *never* to get into *less* than 12, unless he *knows* where he is. The pebbly bottom off the Jersey shore affords warning of the approach to the Squam Beach bight; and the lead, with proper caution, even when the light cannot be seen, will enable any one to keep out of the Fire Island bight.

THE DEEP HOLES.—Lying to the southward and eastward from Sandy Hook are six remarkable holes—shaded on Plate XXIII.—having in their deepest parts from 10 to 12 fathoms more water than is found immediately around them. Beginning with the outer one—for the one to the south of it, that is surrounded by pebbles, is not connected with it by the gully—and taking them in order from seaward, comes *first* the "38 fathom hole" of Blunt's chart, with mud in the deepest part surrounded by sand.*

Second and Third (or second and first 37 fathom holes of Blunt's chart); the first named having from 28 to 37 fathoms of sand, the other from 25 to 39 fathoms of blue mud, surrounded by from 18 to 22 fathoms of sand. These two holes are connected by a gully having 26 or 27 fathoms in it, principally sand, with from 20 to 22 fathoms on the edges. This gully, with the two holes, lies northwest and southeast, and is 20 miles long by 2½ broad, the northwest extremity being about 20 miles, southeast by south from the light-boat.

Fourth (32 fathom hole of Blunt's chart). Depth from 20 to 32 fathoms—sand or shells, pebbles, and gravel—surrounded by from 16 to 18 fathoms; length, north-northwest, 4 miles; breadth, 1 mile. This is connected, by a gully of from 18 to 19 fathoms, with the "first 37 fathom hole," and may be considered as a bight in the 20 fathom curve, reaching up towards Sandy Hook, and coming within about 12 miles southeast of the light-boat.

Fifth and Sixth (21 and 23 fathom holes of Blunt). These two holes appear to be joined together. They lie north and south, and are 7 miles long, by 1½ broad; depth, from 19 to 32 fathoms, muddy bottom, with from 13 to 17 fathoms of sand or sand gravel near the edges. Fifteen fathoms may be carried nearly up to the light-boat. To repeat: this range of holes—with the light-boat at one end, and the 38 fathom hole at the other—is 55 miles long and 14 broad at the outer end, and the inner end only 1 or 2 miles broad. It has in it from 3 to 18 fathoms more water than is to be found on either side of it, and

* Sand and mud are represented on the chart as sand; mud and sand, as mud; the *predominating* character giving the color.

therefore, in connection with the pebble banks to the southward and westward of them, constitute the best landmarks possible for guiding in the dark and through fogs, safely into 12 or 15 fathoms, and within sight or hail of the light-boat.

Now, studying the peculiarities which mark the series of holes, and which are denoted by the kind of bottom as well as the depth, and observing also the fact that, with barely an exception, all the pebbly patches of note are off the Jersey shore, inside the 30 fathom curve, and to the southward or westward of this range of holes, and noting also the long gravel bed south of Montauk Point, it will be at once obvious to the navigator how well the approaches from the sea to the light-boat are marked. His guides here—log and lead—are better than any landmarks ashore, because landmarks ashore may be hidden in fogs and the dark; but here the navigator has them under foot, and can, by feeling, tell within a very little compass as to his true place.

When the navigator finds his vessel in 20 fathoms, and is still doubtful as to her position, let her always steer north or north-northeast, NEVER *west* of north. Now, noting the rate at which she shoals her water—for, if she be off the Jersey shore, she will shoal it slowly, if at all—and recollecting the course she has been steering, the water she has brought along, and the bottom she has had, he will—generally before, but always by the time she gets into 12 fathoms—have no difficulty in judging pretty accurately where she is, no matter how thick the weather may be.

COMING FROM THE EASTWARD.—To a vessel coming from sea, with Sandy Hook bearing anywhere between N. W. and W. S. W., the Block Island soundings (mud and ooze), in blue on the chart, are an excellent guide. If she gets out of this mud and into sand in less than 40 fathoms, she will probably be somewhere to the north of lat. 40°. But if she have more than 40 fathoms when she gets out of the mud, then she is probably south of that parallel. The course and distance sailed through the mud, the depth and the distance run between the mud and the 30 fathom curve, and then the gravel beds, the 20 fathom curve, &c., will leave but little doubt as to position.

COMING FROM THE SOUTHWARD AND EASTWARD.—Suppose a vessel to be coming from the southward and eastward, so as to cross the parallel of 40° lat. somewhere between 71° and 73° W. Here, though she may not sound deep enough nor far enough out for the mud, yet supposing she misses also the long gravel bed south of the east end of Long Island, even then, her rate of shoaling from 40 to 30 fathoms, compared with that from 30 to 20, will leave but little doubt as to the bearing of Sandy Hook. But, suppose the navigator, when he gets into 20 fathoms from this direction, should still feel in doubt as to his position. In such a case, he must either have passed to the eastward of the shaded holes and their connecting gullies, and be somewhere between them and the Long Island shore, or he must be very much out in his reckoning, and is somewhere between these holes and the Jersey shore. Being in doubt and in 20 fathoms, let him steer N. N. E., and he will, by keeping the lead going, soon find out upon which shore he is. If on the Jersey shore, a N. N. E. course will take him along parallel with it, or divergent from it, and the water will shoal very gradually and slowly, if at all. But if he be on the Long Island

shore, the bottom will be steeper. The distance that he carries water between 20 and 12 fathoms will indicate, beyond all doubt, when he is off that shore.

Coming from the Southward.—To a vessel coming from the southward, and crossing the parallel of 39° to the west of 73°, a north course or a course a little to the west of north, according to her distance from the shore, will carry her safely until attention to the lead shall have warned the navigator of her position, either by the pebble patches, or the shaded holes and their connecting channel. Suppose that all these marks escape detection, and leave the navigator still doubting as to his position, and in the dark, there is yet left a last and safe and decisive recourse: being between 12 and 20 fathoms, he has but to steer N. N. E., as vessels coming from S. E. have been recommended to do, and the lead and log together, in connection with the soundings and bottom, the distance run, and the course steered on soundings, will very soon make all clear.

Should the mariner, notwithstanding all these signs, marks, and beacons, find himself in 12 fathoms, and still be in any doubt as to his position, he should *never* venture into *less* than 12 fathoms, nor allow his ship to get into the space represented by the white band along the shore, until he *knows* exactly where he is. His only prudent or safe plan in such a case, is to anchor, or to put the head of his vessel off shore and wait until the fog lifts, the pilot boards him, or until he learns, in some other way, exactly how Sandy Hook bears.

It is scarcely necessary to remind the commanders of steamers and of other vessels from Europe, of the excellent beacons which the Nantucket Shoals and light afford for them, nor of the unerring landmark which the mud from 30 to 40 fathoms, the long gravel bed, &c., make for them. The commanders of steamers coming in and running between the parallels 40° 30′ and 40° 50′, who take care to notice when they first get mud, and when they leave it, and where, and in what water they cross the gravel bed G, will have very little room to doubt as to their longitude.

In approaching Sandy Hook, the variation changes very rapidly, the total change from one part of the chart to another, exceeding a quarter of a point. Vessels may have fallen into difficulty, and possibly been wrecked, by neglecting to allow for this change. The Roman numerals IV, VI, and VIII, show the degrees of westerly variation for the places they represent.

A chart of the whole coast, representing the bottom in colors after this fashion, would be very useful.*

To illustrate the importance of a careful lookout, and attention to the log and lead, when approaching the land when it cannot be readily seen, it may be well to state here that investigations made in France some years since, showed that of the shipwrecks upon that coast for a term of several years, ninety-five in one hundred occurred in the night or in thick weather. And the statistics of wrecks about Sandy Hook would, I imagine, show that but very few are owing to stress of weather, but nearly all to neglect of the landmarks which it is the object of Plate XXIII. to bring out. (May 1, 1855.)

* In 1839, I proposed to the National Institute to undertake the collection of materials for a colored chart of the approaches to our coast, and I am now happy to have an opportunity of showing the advantages of it to the navigator as well as to the geologist.

A LAST WORD.

Referring back to the explanation which I have ventured to offer (p. 650) concerning the "tide rips," that are so often found near the equator, I have received a most beautifully kept abstract log of the barque Falcon, Thomas A. Holt, from Boston to the Sandwich Islands, and thence *via* Batavia and Penang to New York. The abstract commences 1st May, '54, and ends 25th April, '55—it is *complete*. The remarks are copious, sensible, and to the point. Every column is full, and in a note at the end Capt. Holt adds the comfortable assurance: "All the observations are my own personal observations, and you can *rely* on them." It is pleasant to overhaul such logs.

On 31st May, '54, lat. 2° 30′ S., long. 26° 40′ W., Capt. Holt remarks:—

"Regarding *current rips*, I think most navigators are deceived. Current rips are caused by opposite winds on the equator or in the variables, and I think nine times out of ten there is no current, although the observations may give a little easting or westing. All ships close-hauled will make more or less leeway in light winds and a heavy swell (*as is usually the case in the variables betwixt the trades*), which is accounted for as current; but in my opinion there is no current to affect a vessel materially, getting south in the variables. There is a strong magnetic influence not yet accounted for also. I have always noted in the variables, that the water has a very black appearance, if the sky be ever so clear, and the temperature of the water and air much higher; and how sensibly one can perceive the change in the color of the water and the temperature, only with light airs from the S. E. or N. E., as you approach the trades, indicating you are out of the doldrums."

Observations with the hydrometer (James Green, No. 422 Broadway, New York, makes the hydrometers used in the navy), to determine the specific gravity of the water in these tide rips, will settle the question as to their being not so salt as sea water generally is; and I shall be obliged if observers, especially those of the navy, who are furnished with all requisite facilities for the purpose, will address themselves to this inquiry.

I should be glad if other navigators would also furnish me with the observations concerning dews and the appearance of the sky in the South Pacific. Capt. Leighton, of the Marion, who evidently enjoys the aspects of nature, has called my attention to this subject by the following remarks in his abstract log, on a voyage from Australia to Callao, 1854-5:—

"I have," says he, "noticed the cloudless sky and heavy dew which precedes and often accompanies north and N. easterly winds, in the whole belt of the Southern Ocean; but on leaving the transparent sky of the south coast of Australia (say 115° to 155° E.), the appearances of the sky are remarkably like those of the North Atlantic, with the same prevalent westerly winds, except that the splendors of the Southern Hemisphere are over head, and our old friends declining to the northward, with the majestic circular sweeps of the albatross, and other large oceanic birds, without apparent motion of their wings."

The last mail brings the following bottled paper, picked up in May, 1853, on the beach of Brava, east coast of Africa, lat. 1° 7′ N., long. 44° 3′ East:—

"Ship Medford, of ———, from Boston to Calcutta, lat. 14° 15′ S., long. 85° 41′ East, January 3d, 1853. Calm and squalls from N. E. alternately—all well on board."

The cruise of this bottle beautifully illustrates the drift—Plate XIX.—through Torres Strait, and from the Arafoura Sea into the Indian Ocean. The bottle probably had been up towards the mouth of the Red Sea, and when it was cast ashore, it was drifting down with the Mozambique current, p. 88.

I have just received an abstract log containing information concerning the route to Australia in September and October, which is of importance to vessels in that trade.

The "Gertrude," Capt. Wm. L. Phinney, sailed from New York for Melbourne, July 14, 1854, and had a passage of 95 days. She saw ice Sept. 12, lat. 44° 49′ S., long. 15° 15′ W.; Sept. 13, lat. 48° 30′ S., long. 10° 55′ W.; Sept. 15, lat. 49° 34′ S., long. 1° 39′ W.; and Sept. 25, lat. 48° 25′ S., long. 41° 58′ E. In consequence of this ice, prudence compelled him to abandon his intention of a southern route, and to stand more to the northward. I quote his letter and log; they are both interesting.

CALLAO, *January* 10, 1855.

TO LIEUT. M. F. MAURY.

SIR: Having to proceed from this to the Chincha Islands, and remain three months, I avail myself of the present opportunity to forward to you abstracts of my two passages over your southern routes, although not required to do so until my own return to the United States next summer, knowing that you are less amply supplied with abstracts of voyages over these regions, than of many other parts of the ocean; and, such as it is, I am happy to contribute my mite towards furnishing you with material to work out still further towards perfection your great and glorious task, not only of pointing out the most speedy routes for ships to pursue over the ocean, but also of teaching us sailors to look about us, and see by what wonderful manifestations of the great God we are continually surrounded.

For myself, I am free to confess that for many years I commanded a ship, and, although never insensible to the beauties of nature upon the sea or land, I yet feel that, until I took up your work, I had been traversing the ocean blindfolded. I did not think, I did not know the amazing and beautiful combination of all the works of Him whom you so beautifully term the "Great First Thought."

I feel that, aside from any pecuniary profit to myself from your labors, you have done me good as a man. You have taught me to look above, around, and beneath me, and recognize God's hand in every element by which I am surrounded. I am grateful for this personal benefit. Your remarks on this subject, so frequently made in your work, cause in me feelings of the greatest admiration, although my capacity to comprehend your beautiful theory is very limited.

The man of such sentiments as you express will not be displeased with, or, at least, will know how to excuse, so much of what (in a letter of this kind) might be termed irrelevant matter. I have, therefore, spoken as I feel, and, with sentiments of the greatest respect, remain

Your obedient servant,

(Signed) WM. L. PHINNEY.

Abstract Log of the Ship Gertrude (WM. L. PHINNEY). *From New York to Melbourne, Australia*, 1854.

Date.	Latitude at noon.	Longitude at noon.	Currents. (Knots per hour.)	BAROMETER.		THER. 9 A. M.		WINDS.		
				Height.	Att'd ther.	Water.	Air.	First part.	Middle part.	Latter part.
Aug. 26	9°17′ S.	33°53′ W.		30.05	81°	80°		E. S. E.	E. S. E.	E. S. E.
27	12 00	34 21		30.03	79	80		E. S. E.	S. E. by E.	S. E. by E.
28	15 07	34 47	1 k., S.	30.10	79	78		S. E. by E.	S. E.	S. E. by E.
29	16 31	34 00	½ k., S.	30.08	79	74		East	N. E.	N. N. E.
30	17 11	33 44		30.05	80	76		North	Calm	N. E.
31	18 23	33 15		30.07	80	72		N. E.	N. E.	N. E.
Sept. 1	20 36	31 53		29.98	78	72		N. E.	N. N. W.	W. N. W.
2	21 41	29 52	1 k., N.	30.03	71	68		S. W.	S. S. W.	South
3	21 45	28 50		30.05	74	70		S. by E.	Calm	S. S. E.
4	23 30	29 18		30.05	73	68		S. E. by S.	S. E.	S. E. by E.
5	26 00 D. R.	29 30 D. R.		30.00	73	68		S. S. E.	E. S. E.	N. E.
6	29 20 D. R.	29 30 D. R.		30.06	71	68		East	E. by S.	E. by N.
7	33 38 obs.	27 15 obs.		30.04	70	63	68°	E. by N.	E. N. E.	N. E. by E.
8	36 54	25 42		29.53	69			N. E.	N. E.	N. W.
9	39 04	24 02		29.55	66	50		N. W.	N. W.	N. N. W.
10	41 00 D. R.	21 00 D. R.		29.50	64	46		N. N. W.	North	N. N. E.
11	43 25	17 48		29.74	62	41		N. N. W.	N. W.	W. S. W.
12	44 49	15 15		30.04	58	38		S. W.	W. S. W.	N. N. E.
13	47 30 D. R.	10 55 D. R.		29.50	56	32	42	N. N. W.	N. N. W.	N. N. W.
14	48 27	6 40		29.42	54	32	42	N. N. W.	N. N. W.	N. N. W.
15	49 34 obs.	1 39 D. R.		29.15	55	30		N. N. W.	N. N. W.	W. N. W.
16	48 54 D. R.	3 42 obs. E.		29.78	50	34		W. N. W.	West	West
17	47 26	8 30 D. R.	1 k., N.	30.34	52	34		West	W. S. W.	W. S. W.
18	47 26 D. R.	11 26 D. R.		30.46	48	34		S. S. W.	S. W.	N. N. E.
19	47 26 D. R.	17 35 D. R.		30.04	53	34		E. N. E.	North	N. N. W.
20	47 15	22 25		29.95	54	36		N. W.	West	W. N. W.
21	47 08	27 06		30.05	53	37	52	West	W. N. W.	N. W.
22	47 35	32 01		29.94	55	39	52	N. W.	N. W.	W. N. W.
23	47 01	35 56		30.20	53	41	50	S. W.	S. by E.	S. S. E.
24	48 05	37 51		30.22	50	36	47	E. S. E.	E. by S.	E. by N.
25	48 25 D. R.	41 58 D. R.		29.64	52	32	46	N. E. by E.	N. N. E.	North
26	48 15 D. R.	45 00 obs.		29.80	53	32	45	N. W.	North	E. N. E.
27	48 00 D. R.	50 00 D. R.		29.48	54	34	48	E. N. E.	N. E.	North
28	48 00 D. R.	53 00 D. R.		29.10	50	32	46	W. N. W.	S. W.	E. N. E.
29	48 02	58 38		29.40	52	34	47	North	W. N. W.	N. W.
30	47 10	63 25		29.15	54	32	47	N. W.	N. W.	N. W.
Oct. 1	46 15	68 30		29.70	58	40	53	N. W.	N. W.	W. N. W.
2	47 02 D. R.	70 03 D. R.		29.23	54	35	46	West	E. by N.	E. S. E.
3	45 40 D. R.	72 25		29.80	54	41		E. S. E.	S. S. E.	S. S. W.
4	45 49	76 05	1 k., W.	29.78	55	48	50	S. S. W.	N. W.	N. N. W.
5	46 07	81 00		29.50	57			North	North	N. N. W.
6	46 15	84 34		29.50	55	42	52	W. N. W.	W. N. W.	N. N. W.
7	45 39	90 00		29.68	58	44	52	W. N. W.	W. N. W.	West
8	45 00	94 47		29.85	54	45	44	S. W.	S. S. W.	S. S. W.
9	44 50 D. R.	98 29		29.75	55	44	50	South	S. by W.	W. N. W.
10	45 04	103 32		29.85	56	48	50	W. N. W.	W. S. W.	S. S. W.
11	45 12	108 00		29.55	60	48	54	W. N. W.	North	North
12	45 22	113 33		29.52	59	46	52	N. W.	N. W.	N. W.
13	45 10 D. R.	117 35		29.55	56	46	50	West	West	N. by E.
14	44 44 D. R.	123 10		29.18	58	46	52	North	North	North
15	44 00 D. R.	127 00		29.15	64	46	56	N. N. W.	N. N. W.	N. N. W.
16	43 17	131 51		29.50	59	48	54	N. N. W.	N. W.	N. W.
17	42 04	136 22		29.55	60	49	54	N. by W.	N. by W.	N. by W.
18	40 41	139 45		29.78	59	50	52	N. by W.	W. N. W.	W. S. W.
19	39 31	142 48		30.10	60	54	54	S. W. by W.	S. W. by W.	W. S. W.
20				30.20	62		55	S. W.	S. W.	S. W.

August 26. Moderate and pleasant.

Aug. 27. Latter part, very pleasant weather and moderate trades; sea smooth.

Aug. 29. Comes in moderate and fine; during the night very light airs, nearly calm at times. Latter part, squally, calm, baffling all around the compass; ends light breeze from E. N. E.

Aug. 30. Very light baffling winds and calm till 8 A. M. Latter part, light airs from the N. E. and pleasant.

Aug. 31. Throughout very light breezes and nearly calm, with a large swell from the S. S. W.; passed a foreign brig standing north. Ends with light breezes from N. E.

Sept. 1. Moderate, increasing breezes from the north, veering to the westward, and freshening through the night and latter part. At noon, changed in a squall to S. W. strong.

Sept. 2. Moderate, veering to the southward; squally through the night; very large swell from the south; ends find weather.

Sept. 3. Calm, squally, variable wind all around the compass; tremendous swell from S. W. all day, rolling and starting fearfully; no prospect of change.

Sept. 4. Moderate and easterly all day; fine weather; still a very large swell from S. S. W.; ends moderate breezes.

Sept. 5. Moderate from E. S. E., increasing; clouds through the night; wind veering to north. Latter part, strong breezes from N. E., and cloudy; very large swell from S. S. W.

Sept. 6. Fresh and rainy, increasing breezes, squally appearances. 5 P. M., in light sails and steering sails. Hard rain and strong wind; double-reefed topsails, in jib and staysails; blowing hard and raining. Barometer steady at 30.00, till after the worst was over, when it slightly receded, and then rose .06.

Sept. 7. Strong winds and thick, squally, rainy weather; under single reefs, with topgallant-sails over all day; ends squally, hazy weather.

Sept. 8. Comes in strong breeze; midnight heavy gales, hard rain. 5 A. M. moderating, veering to N. W.; high, bad sea. Ends moderate and pleasant.

Sept. 9. Moderate, with very rough sea; fresh during the night, and clear; morning squally; ends hard squall of rain.

Sept. 10. Squally and rainy; much lightning and thunder during the night; hail squall, breeze variable, and high sea from N. W.; ends cloudy, with rain.

Sept. 11. Good weather; wind veering to northward, very light.

Sept. 12. Fresh breeze, increasing, thick at times, and rainy; brisk gale in the morning, with rain. At 11 A. M. passed under the lee of a large *iceberg;* am surprised to find ice so far north at this season of the year. *A short time previous passed a large mass of kelp.*

Sept. 13. Strong gales and rainy, thick weather; during the night, moderate and rainy; morning, good weather, but hazy at times; made all sail. At meridian made *another iceberg* under our lee, smaller than the one seen yesterday; don't like it.

Sept. 14. Fresh breeze, increasing through the night; morning, squall of hail, snow, and rain; bad weather.

Sept. 15. Brisk gale, increasing, veering to the west, squally, very high and broken sea; passed masses of kelp. At 5 P. M. passed to leeward of two small icebergs, one of which appeared like a square tower or obelisk, about sixty feet high; and at sunset saw another on the larboard bow, very small. The weather at times very thick, and the sea high and broken; now this is getting dangerous, and, as much as I regret to leave this fine wind and rolling sea from the west, I must get to the north gradually, for I consider it imprudent to run the ship through these long dark nights and thick weather, with so much of this small ice about. Had I only seen large islands, as at first, I should have kept on; in fact it was my intention to have run down on the parallel of 55°; but I must give it up, particularly as I have a crew of miserable, half-clad negroes, several of whom are already disabled, and I perceive that with them, I shall soon be unable to handle the ship in this cold boisterous region. The above I trust will be considered sufficient cause for my abandoning a route which I believe to be the right one, only for the ice which I have been unfortunate enough to find, while it seems others have run clear, even in 53° or 54°. All that is said in favor of this southern route by Lieutenant Maury is true, and more; for these westerly gales, though strong, have at no time been violent; I have carried double reefs through them all; and this rolling sea from the westward is magnificent; but I must leave it all, so here goes for 47°, and a milder region. All hands on the alert throughout the night looking out for ice; frequent thick squalls of snow and hail to the end of the day, which closes thick and hazy, and high sea.

Sept. 16. Brisk gales and frequent squalls of snow and hail all day; cold, boisterous weather; sun obscured; no observation; steering east, 1¾ points westerly variation.

Sept. 17. Fresh breezes and constant squalls of snow and hail until 6 P. M. Cloudy, overcast, dark weather till near meridian; breeze moderate; all sail. Barometer has been steadily rising for thirty-six hours, and is now higher than since I left New York; fine rolling sea; shall now try this parallel for a while; weather still cold; wind S. W. veering to south, which may account for this rise in the barometer; passed kelp occasionally during the morning.

Sept. 18. Moderate from S. S. W. till 8 P. M.; during the night, baffling from south to west; morning N. N. E., veering to north and freshening. Barometer rose to 30.50, and then, as the wind shifted to the north, began to fall slowly; weather cloudy and overcast, but warmer, and the sea smooth.

Sept. 19. Strong breezes and cloudy weather; wind backing into same old quarter; begin to think this not a bad parallel to run on. At daylight passed a large, black, lower yard. Ends cloudy and rainy; going fast under single reefs. No observation; distance per log 252 miles.

Sept. 20. Fresh breezes and rainy till midnight; latter part, moderate, passing clouds, clear at times.

Sept. 21. Moderate, with light rain squalls; clear during the night; very large swell from the westward; ends passing clouds and increasing breeze from the west.

Sept. 22. Moderate, rainy through the night; morning, better weather, all sail set, good sea after us; ends passing foggy clouds, warm and pleasant.

Sept. 23. Light from S. W., veering to south. Latter part, fresh from S. S. E.; good weather, passing clouds. Barometer up again with this southerly wind.

Sept. 24. Fresh breezes from E. S. E. 4 P. M. tacked to southward; fine weather; wind veering slowly to northward; spliced fore-topgallant sail. Ends strong from E. N. E.; saw the spouts of two whales, apparently sperm whales.

Sept. 25. First and middle parts, strong breezes and cloudy; latter part, light breezes and thick fog, large swell from the north. Barometer steadily falling since yesterday.

Sept. 26. Comes in light airs from W. N. W., and thick fog. At 2 P. M. passed within three hundred yards of an iceberg, not more than fifteen feet above water; small above, but immensely large under water, as we could see in going past; the part visible much worn into crevices or fissures, much resembling a branch of coral. Is this a safe track to pursue? Moderate, and clear at times, during the night. Ends light breezes from E. N. E., and thick fog; water down to 32, and every indication of ice at hand. At one time in the night it grew suddenly *very cold;* think we passed near an iceberg.

Sept. 27. Thick fog, with occasional squalls of rain throughout the entire day; wind veering to north and west, but we seem to have lost our fine rolling sea. Bad weather; I am going a little further north soon.

Sept. 28. Thick fog nearly all day, with occasional squalls of rain; wind went round the compass again and freshened. At noon in light sails; wind veering to north. Bad weather this, and as I don't find a steady wind here, I shall go north a little.

Sept. 29. Strong breezes and thick till 8 P. M. At daylight, moderating; made all sail. Ends light breezes and passing clouds.

Sept. 30. Fresh, increasing breeze; stormy and flawy through the night; split spanker and mizzen-topsail by parting topsail sheets. Ends with gale and clear. High sea after us again.

Oct. 1. Brisk gales and clear, with large sea from N. W.; after midnight more moderate; weather fine to the end.

Oct. 2. Moderate and fine. 6 P. M. calm, veering rapidly round at 8 P. M. to N. E. and E. S. E., and blew up a strong gale, with thick, hazy weather, turning into hail, snow, and rain. Daylight, the water appearing discolored, wore ship to the northward, and while preparing to sound, ran off into blue water again. Ends rainy and strong gales from E. S. E.; bad sea.

Oct. 3. Begins blowing hard; under short sail. At 6 P. M. wind hauled to S. S. E.; strong gales throughout; snow squalls in abundance during the morning; ends flying clouds and squalls of snow.

Oct. 4. Moderate throughout; good weather; all sail set; ends pleasant and moderate.

Oct. 5. Strong breezes, flying clouds, large sea. Morning, wind veering more to northward, flawy; in royals. 8.30 carried away jib-boom by the cap; kept before the wind three hours, to clear the wreck; got out weather boom. Ends rain squalls, bad weather; wind N. W., squally; passed immense quantities of kelp.

Oct. 6. First and middle parts, pleasant weather; light breeze, with a very large swell from N. W. Latter part, squally, rainy, fresh breezes; in all light sails. Large quantities of kelp seen all day. Bent new jib, and made all snug again.

Oct. 7. Strong breezes and squally, with high sea; all day under single reefs and topgallant-sails over. Large quantities of kelp in sight all day; should think there must be land somewhere in this vicinity, from the great quantities of it seen for three days past.

Oct. 8. Brisk gales veering to the southward; violent squalls of wind, hail, and snow throughout the night, moderating towards meridian; much kelp still in sight; where does it come from?

Oct. 9. Good weather, moderating fast; made all sail; latter part, hazy, with increasing breezes from W. N. W.; no kelp to day.

Oct. 10. Moderate, increasing breezes, and drizzling wet weather, with brisk gales through the night and morning, and moderating towards meridian; weather fine; much kelp again, some of enormous size and length.

Oct. 11. Comes in very light, with fine weather, increasing towards night and veering to the north; strong gales all the remainder of the day, with a large rolling sea after us; passing clouds and drizzling rains at times to the end; less kelp seen to-day, and the weather warmer.

Oct. 12. Brisk gales from N. W. all day, with large rolling sea after us. Weather clear and cloudy alternately through the day; occasional squalls of rain through the night; ends bright and fair; no kelp seen to-day.

Oct. 13. Light breezes, with very high sea from the westward; passing clouds during the night; clear at times. At midnight had a fine view of the Aurora Australis. The whole southern horizon was illuminated; and through the range of dark clouds that lay stretched along the horizon spurs of light shot up nearly to the zenith, changing form and color rapidly, for the space of an hour.

Oct. 14. Strong gales and thick, overcast, rainy weather; under single reefs. Sun obscured; no observation. Distance 240 miles, E. ½ north.

Oct. 15. Strong gales and thick, rainy, bad weather; under short sail during the night; morning, made sail; ends rainy.

Oct. 16. First and middle parts, rainy, dark weather; latter part, clear, fine weather; brisk breeze all day; large sea from N. N. W.

Oct. 17. Strong breezes from N. by W., and clear weather throughout.

Oct. 18. At 5 P. M. wind changed in a hard squall, to W. N. W.; clear throughout the remainder of the day, with a fine large swell after us. At 10 A. M. a hard squall of hailstones, very large.

Oct. 19. Light breezes from the S. W., and fair pleasant weather all this day. At 4 P. M. exchanged signals with a British ship bound in; morning, still in company; ends very light.

Oct. 20. At 3 P. M. made the land fifteen miles west of Cape Otway; ran in past the light, at 6 P. M.; and at 10 P. M. hove to for daylight. 5 A. M. made sail; and at 11 took a pilot, entered the port and proceeded up the bay; and at 6 P. M. anchored off Williamstown, making our passage 95 days, 6 hours; 57 days from the line. Ship not a clipper, and not half manned. Thanks to Maury's Charts and Sailing Directions!

WM. L. PHINNEY.

Another caution is necessary to navigators in this trade, that have a fancy on the outward passage, to run down their longitude between the parallels of 51° and 53°. There is a group of newly discovered and not accurately determined islands in the way. They are between the parallels of 52° 53′ 36″ and 53° 12′ S., and the meridians of 72° 35′ and 74° 40′ E. They were first seen by Captain Heard, of the American barque Oriental, November 25, 1853. On the 12th June, 1854, the fact was duly reported by me to the government of the United States, and the importance of sending a vessel of the navy to look after them and fix their position was urged upon the Navy Department. Since their discovery by the Oriental, they have been seen and reported by four English vessels, viz: The Samarang, Captain M'Donald, January 3, 1854; the Earl of Eglinton, Captain Hutton, 1st December, 1854; the Lincluden Castle, Captain Rees, 4th December, 1854; and the Herald of the Morning, Captain Attwaye, 3d and 4th December, 1854. Captain Heard reports a peak of the island he saw, to be 5,000 feet high.

There has been another question raised which bears upon what has been said in Chapter VI. p. 65, and other parts of this work, concerning the offices which, in the sublime system of terrestrial arrangements, have been assigned to the salts of the sea.

On the 20th of January last, Professor Chapman, of the University College, Toronto, communicated to the Canadian Institute a paper on the "Object of the Salt Condition of the Sea," which he maintains is "*mainly intended to regulate evaporation.*" To establish this hypothesis, he shows by a simple but carefully conducted set of experiments, that the salter the water, the slower the evaporation from it; and that the evaporation which takes place in 24 hours from water about as salt as the average of sea water, is 0.54 per cent. less in quantity than from fresh water.

This suggestion and these experiments give additional interest to our investigations into the manifold and marvellous offices which, in the economy of our planet, have been assigned by the Creator to the salts of the sea. It is difficult to say what, in the Divine arrangement, was the *main* object of making the sea salt and not fresh. Whether it was to assist in the regulation of climates, or in the circulation of the ocean, or in re-adapting the earth for new conditions by transferring solid portions of its crust from one part to another, and giving employment to the corallines and insects of the sea in collecting this solid matter into new forms, and presenting it under different climates and conditions; or whether the main object was, as the distinguished professor suggests, to regulate evaporation—it is not necessary now or here to discuss. I think we may regard all the objects of the salts of the sea as *main* objects.

But we see in the professor's experiments the dawn of more new beauties, and the appearance of other exquisite compensations, which, in studying the "wonders of the deep," we have so often paused to contemplate and admire. As the trade-wind region feeds the air with the vapor of fresh water, the process of evaporation, as we are taught by his experiments, is checked, for the water which remains, being salter, parts with its vapor less readily; and thus, by the salts of the sea we perceive that floods may be prevented. But again, if the evaporating surface were to grow salter and salter, whence would the winds derive vapor duly to replenish the earth with showers?—for the salter the surface, the more scanty the evaporation. Here, again, is compensation the most exquisite, effected through the salts of the sea. We have seen them

employed in the important work of re-adapting the earth, and of fitting it for the well-being of large families of plants and animals by taking effete soils and barren rocks from one clime, dissolving them and carrying them off to be made evergreen islands of in another. We have seen the insects of the sea acting as conservators of the ocean by regulating the quantity and proportion of those salts; and now we see these same ingredients of marvellous and manifold offices, serving also in their turn as checks and balances to both sea and air. Thus we we perceive how, by reason of the salts of the sea, drought and famine, if not prevented, may be, and probably are, regulated and controlled—for that compensation which assists to regulate the amount of evaporation is surely concerned in adjusting also the quantity of rain. Were the salts of the sea lighter instead of heavier than the water, they would, as they feed the winds with moisture for the cloud and the rain, remain at its surface, and become more niggardly in their supplies, and, finally, the winds would howl over the sea in very emptiness, and instead of the cooling and refreshing sea breezes, to fan the invalid and nourish the plants, we should have what is now the grateful trade-wind coming from the sea in frightful blasts of parched and thirsty and blighting air. But the salts, with their manifold and marvellous adaptations, come in here as a counterpoise, and, as the waters attain a certain degree of saltness, they become too heavy to remain longer in contact with the thirsty trade-winds, and are carried down, because of their salts, into the depths of the ocean; and thus the winds are, by the salts of the sea, *dieted* with vapor in due and wholesome quantities.

In this view of the subject, and for the purpose of carrying on the investigations which Professor Chapman's interesting paper suggests, observations upon the specific gravity of sea water become still more interesting. It is to be hoped, therefore, that my fellow-laborers at sea will not slight column 21 in the Man-of-war Abstract Log.

I have added, by way of appendix, a lithographic copy of Capt. Foster's abstract log, as an example of what an industrious and zealous observer may do with very simple means. With the glasses or telescope of his sextant, he rigs up a microscope, and sends the most beautiful *colored* drawings of the curious forms of organic life that he finds sporting in the sea. Many navigators have kindly collected and sent me phials of sea water, which they found swimming with animalculæ. But these delicate little organisms soon perish; and when the bottles arrived, nothing of their forms could be distinguished but amorphous masses of fetid matter. Capt. Foster's drawings, therefore, inasmuch as they are not colored on the lithograph, do not do him full justice. Now here is a field of research abounding with the gelatinous animalculæ of the sea, and rich with rare and precious gems, which can only be studied at sea. The specimens cannot be preserved long enough for examination. They should be studied, and sketched, and described while alive in the water, and therefore it is hoped that Capt. Foster's attempt may stimulate some one to prepare himself with the means of describing such things in a proper and satisfactory manner. Hence the publication of his beautifully kept abstract log. Any one who desires to undertake such description, should provide himself with a microscope, and be careful to make his drawings properly. Prof. Bailey's microscopic drawings may be taken as a pattern.

CONDITIONS UPON WHICH THE WIND AND CURRENT CHARTS ARE FURNISHED TO NAVIGATORS.

It is supposed that the proceedings of the Maritime Conference at Brussels will give a new impulse to the Wind and Current Charts, and greatly increase the number of laborers in this field of research. To enlarge the corps of observers, and to extend the benefits of this system of observations, the Hon. J. C. Dobbin, Secretary of the Navy, has authorized the merchant vessels of all friendly nations trading upon the high seas, to be put upon a footing with American vessels as it regards these Charts. (See below.)

He has, moreover, commanded the abstract log recommended by the Conference at Brussels, to be used on board of every man-of-war; and he recommends the same to be done by merchantmen, as per the following

GENERAL ORDER.

NAVY DEPARTMENT, *November* 3, 1853.

The form of the "Abstract Log" recommended by the late Maritime Conference at Brussels is hereby approved and adopted for use in the Navy of the United States.

It is recommended to navigators generally, and will be faithfully kept on board of all vessels in the naval service.

Commanding officers of vessels are especially charged with the execution of this order; and they will transmit copies of the abstract kept on board, to the Chief of the Bureau of Ordnance and Hydrography, at the end of the cruise, and at such other times as he may direct.

Signed, J. C. DOBBIN,
Secretary of the Navy.

To entitle the navigator to a copy of these Charts, or rather, of such sheets as relate to his cruising grounds, and a copy of the Sailing Directions, he should be able to show that he is qualified and prepared to make the observations required of him; or, in other words, that he is provided with the requisite instruments, which should be, at least, one good steering compass, one good sextant, one mercurial barometer, and three air and water thermometers. I say at least, because the above enumeration includes only the instruments that are essentially necessary to enable the navigator to comply with his part of the agreement; and his part of the agreement, it should be distinctly understood, does not terminate with one voyage, nor with two, but it is intended to be binding upon him as long as materials are required for the prosecution of the work. On arriving in any port of the United States, those leaves only of the abstract log that are occupied with the records of the voyage should be cut from the pamphlet, and mailed to me at the Observatory, Washington. If mailed as "ship letters," which, by post-office regulation they are considered to be, they will come without the prepayment of postage. Those masters who arrive in New

York, however, are requested to hand their journals over to the agent of this office, George Manning, 142 Pearl Street.

New Charts are in process of construction or publication all the time. Co-operators, therefore, when they arrive in the United States, should report as to their next voyage, in order that they may be supplied with the latest publications. These are to be had by application to the Superintendent of the Observatory, or to his New York agent, George Manning, 142 Pearl Street.

In foreign countries, the following-named offices or establishments are charged with the distribution of the Charts and Sailing Directions to shipmasters, each to those of the nation to which the distributing office belongs:—

HOLLAND.—Meteorological Institute, Utrecht. M. Ballot.

ENGLAND.—Meteorological Department, Marine Department, Board of Trade, London. Capt. Robt. Fitz Roy, R. N.

PORTUGAL.—Polytechnic School, Lisbon. Dr. G. J. A. D. Pegado.

RUSSIA.—Hydrographical Office, St. Petersburg. Admiral Wrangell.

SWEDEN AND NORWAY.—Marine Department.

DENMARK.—Hydrographical Office, Copenhagen. Capt. P. Rothe.

SPAIN.—Minister of Marine, Madrid.

PAPAL STATES.—Minister of Marine.

BELGIUM.—Minister of Marine.

SARDINIA.—Minister of Marine.

BRAZIL.—Minister of Marine.

CHILI.—Minister of Marine.

AUSTRIA.—Board of Trade, Trieste.

These Charts, it cannot be too often repeated, are based upon information collected, for the most part, by private ship-owners and masters. The information being furnished to the government gratuitously, the government incurs the expense of publishing it, and of making it available to navigators. The government then offers a copy of the Chart so published to every navigator, upon condition that he will continue to keep and forward to this office abstract logs of his voyages, which abstracts are required to be kept according to the form herein prescribed.

Every navigator who, after receiving a copy of the Charts, fails to comply with these conditions—viz: to keep abstracts of his voyages, as per form, and to transmit them to me, at the National Observatory, on his return to the United States; or, on his return to his own country, to transmit them to the person appointed to receive them—forfeits his claim, not only to all future publications, but is bound to surrender up those he may have received.

Why do so many American navigators fail to fill properly with observations, the three columns in the Brussels form of the Abstract Log, headed (p. 192) "FORMS AND DIRECTION OF CLOUDS." "PROPORTION OF SKY CLEAR." "HOURS OF FOG, RAIN, SNOW, HAIL."? I ask the question because I judge the impression

has got out, that these columns are but of little consequence. If any such notion have gone abroad, it is both erroneous and mischievous. The information called for by these columns is of great value and importance, and I hope they will not be slighted hereafter.

The following is the form of the receipt which every navigator is required to sign for such Charts as he may receive:—

FORM OF RECEIPT.

Received this *day of* 185
from *one Abstract Log, one Copy of*
Maury's Sailing Directions, *edition, and*
sheets Nos. (*Series A.*)
do. do. (" *B.*)
do. do. (" *C.*)
do. do. (" *D.*)
do. do. (" *E.*)
do. do. (" *F.*)

MAURY'S WIND AND CURRENT CHARTS; *for, and in consideration of which I promise to keep, in the manner and form prescribed, a journal of my Voyages, and, on my return, to transmit the same to the National Observatory, Washington.*

____
Commanding ______________________
of ______________________
Bound ______________________

Navigators will please bear in mind that the abstract logs which they return to this office, are to be bound, and to be preserved for use and reference for an indefinite period. Therefore, it is desirable that care should be used with the abstract on board ship, so that it may be returned in good condition for preservation.

For these reasons, it is desired that the abstract log should be returned only at the end of the voyage, and not, as heretofore, when the voyage has been half completed. Vessels, therefore, in the California trade, are requested not to return their logs from San Francisco, but to continue them, and transmit them on their return to the Atlantic States.

It may be proper to add here, that the navigator who receives a copy of the *Charts and Sailing Directions* is expected to give his co-operation by keeping an abstract log, not only for the voyage upon which he may then be bound, but for all subsequent voyages, or until he shall be informed that no farther co-operation is desired.

And whalemen will please recollect that their abstracts must embrace, for *every day that they are not at anchor*, a regular record of their latitude and longitude, force and direction of the wind three times a day, temperature of the air and water, and mention of whales whenever seen.

NAMES OF THE OFFICERS EMPLOYED IN THE CONSTRUCTION OF THE WIND AND CURRENT CHARTS.

North Atlantic Track Charts.—Lieuts. D. D. Porter, Whiting, Herndon, Wyman, Beaumont, Temple, Gibbon, and Prof. Flye.

North Atlantic Thermal Charts.—Lieut. Gantt and Prof. Flye.

North Atlantic Pilot Charts. (All denominations of Pilot Charts.)—Lieuts. Herndon, Dulancy, H. N. Harrison, Ball, Forrest, Balch, Davenport, Wainwright, Roberts, Fitzgerald, and Deas, Prof. Benedict, Passed Midshipmen Powell, De Koven, De Krafft, Woolley, Jackson, Murdaugh, Semmes, Johnson, Lewis, Terrett, Wells, and Brooke.

North Atlantic Trade-Wind Chart.—Lieut. De Haven.

North Atlantic Storm and Rain Charts.—Lieuts. Minor, Ball, and W. Rogers Taylor.

South Atlantic Track Charts.—Lieuts. Whiting, Temple, and Gibbon, Profs. Benedict and Flye, Passed Midshipmen Woolley and Badger.

South Atlantic Thermal Charts.—Lieut. W. Ross Gardner and Prof. Flye.

South Atlantic Storm and Rain Charts.—Lieuts. Minor, Beaumont, Guthrie, and Passed Midshipman Young.

North Pacific Track Charts.—Lieuts. Whiting, Gibbon, and W. C. B. S. Porter, Prof. Flye, Passed Midshipmen Fillebrown and Badger.

North Pacific Thermal Charts.—Lieut. W. Ross Gardner.

South Pacific Track Charts.—Lieuts. Whiting, Gibbon, Balch, and W. C. B. S. Porter, Prof. Flye.

Indian Ocean Track Charts.—Lieuts. Whiting, Gibbon, Balch, Temple, Wyman, and W. C. B. S. Porter, Prof. Flye, and Passed Midshipman Brodhead.

Indian Ocean Thermal Charts.—Lieut. W. Ross Gardner.

Whale Chart.—Lieuts. Herndon and Welsh, Midshipman Jackson.

Programme Chart.—Lieut. Wyman and Passed Midshipman Jackson.

STATEMENT, SHOWING THE CHARTS THAT HAVE BEEN PUBLISHED, AND STATE OF FORWARDNESS OF THOSE REMAINING TO BE PUBLISHED.

North Atlantic Track Charts, in eight sheets, extending from 20° E. to 100° W., and from the equator to 65° 30′ N. Nos. 2, 3, 6, and 7, have been re-engraved. All published.

North Atlantic Thermal Charts, in eight sheets, and of the same dimensions as the Track Charts. All published.

North Atlantic Pilot Charts, in two sheets, extending from 0° to 100° W., and from the equator to 70° N. Second edition. All published.

Trade-Wind Chart of the North Atlantic, in one sheet, extending from 10° W. to 100° W. Published.

Storm and Rain Chart of the North Atlantic, in one sheet, extending from 10° E. to 100° W., and from the equator to 60° N. Published.

South Atlantic Track Charts, in six sheets, extending from 20° E. to 70° W., and from the equator to 65° 30′ S. Sheets 1, 2, and 3, are a second edition. All published.

South Atlantic Thermal Charts, in six sheets, and of the same dimensions as the Track Charts. All published.

South Atlantic Pilot Charts, in two sheets, extending from 20° E. to 70° W., and from the equator to 70° S. All published.

Pilot Chart for the Coast of Brazil, in one sheet, extending from 29° W. to 39° W., and from 1° S. to 25° S. Published.

Cape Horn Pilot Chart, in two sheets, extending from 55° W. to 91° W., and from 50° S. to 62° S. Published.

Storm and Rain Chart of the South Atlantic, in one sheet, extending from 20° E. to 70° W., and from the equator to 60° S. Published.

North Pacific Track Charts.—This series, when completed, will consist of eleven sheets, extending from 70° W. to 110° E., and from the equator to 65° 30′ N. Of these, sheets Nos. 6, 7, 8, 9, 10, and 11, have been published. The Coast Line has been engraved for all the other sheets.

NORTH PACIFIC THERMAL CHARTS, in eleven sheets, and of the same dimensions as the Track Charts. Considerable progress has been made in the construction of this series; but the work upon them has been suspended, for the present, for want of force.

NORTH PACIFIC PILOT CHARTS, in six sheets, extending from 15° E. to 75° W., and from the equator to 70° N. Of these, sheets Nos. 1, 2, 3, 5, and 6, have been published. Sheet No. 4 is in process of construction.

STORM AND RAIN CHARTS, FOR THE NORTH AND SOUTH PACIFIC OCEANS, are being constructed.

SOUTH PACIFIC TRACK CHARTS.—This series will consist of ten sheets, extending from 140° E. to 70° W. Sheets Nos. 5 and 10 have been published, and the Coast Line has been engraved for Nos. 3 and 4.

SOUTH PACIFIC PILOT CHARTS.—This series will consist of six sheets, of which Nos. 1, 2, and 6, have been published. The remaining sheets are now under construction.

INDIAN OCEAN TRACK CHARTS.—This series will consist of eleven sheets, extending from 20° E. to 140° E. Of these, Nos. 4 and 5 have been published, and the Coast Line has been engraved for the remaining sheets.

INDIAN OCEAN THERMAL CHARTS.—The series will consist of eleven sheets, and will be of the same dimensions as the Track Charts. Considerable progress has been made in the preparation of all of the sheets of this series; but the work upon them has been suspended, for the present, for want of material.

PILOT CHARTS FOR THE INDIAN OCEAN are included under the head of SOUTH PACIFIC PILOT CHARTS.

WHALE CHART OF THE WORLD, in four sheets. All published.

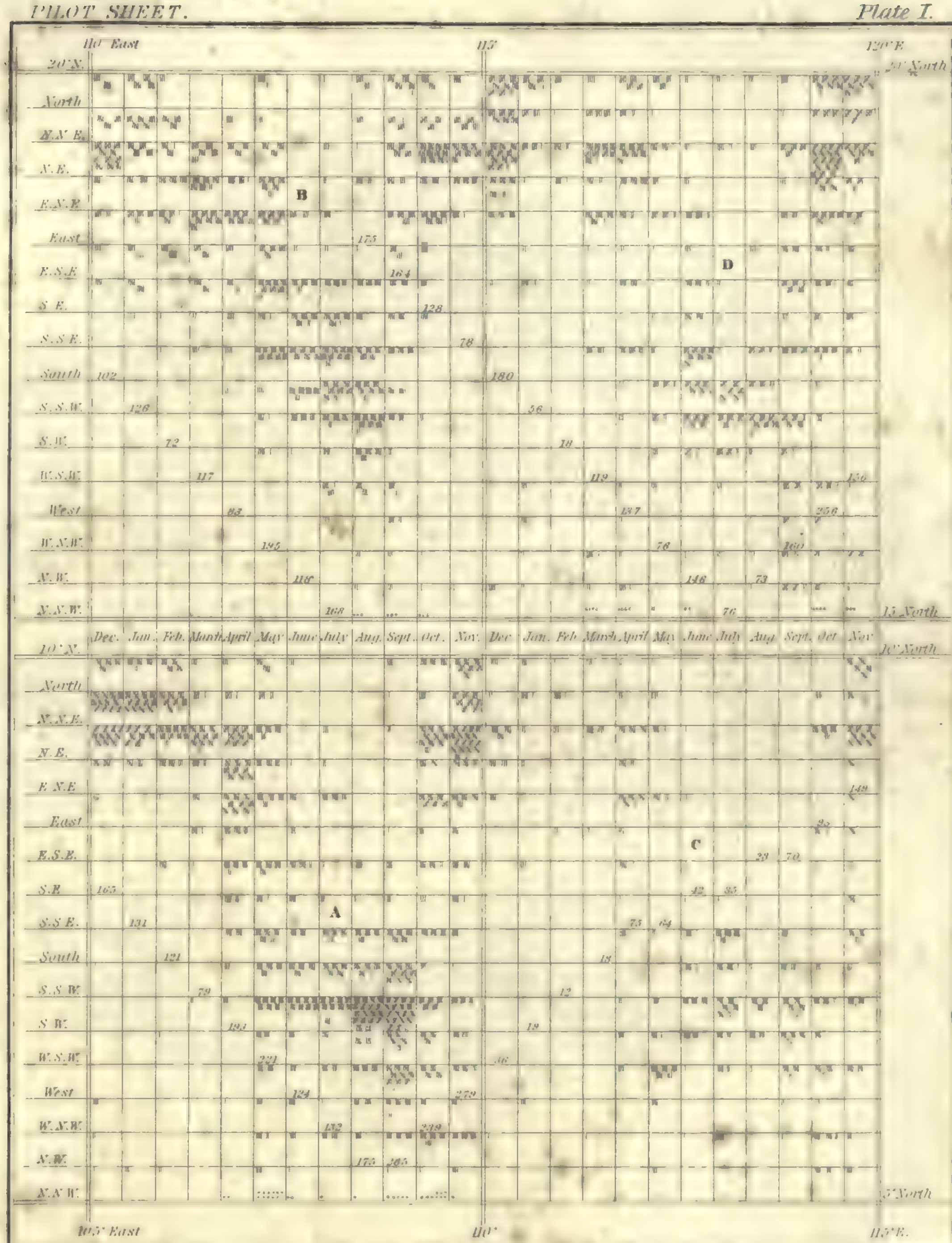
PROGRAMME WHALE CHART, in one sheet. Published.

PHYSICAL MAP OF THE OCEAN, in four sheets—in process of construction.

RECAPITULATION.

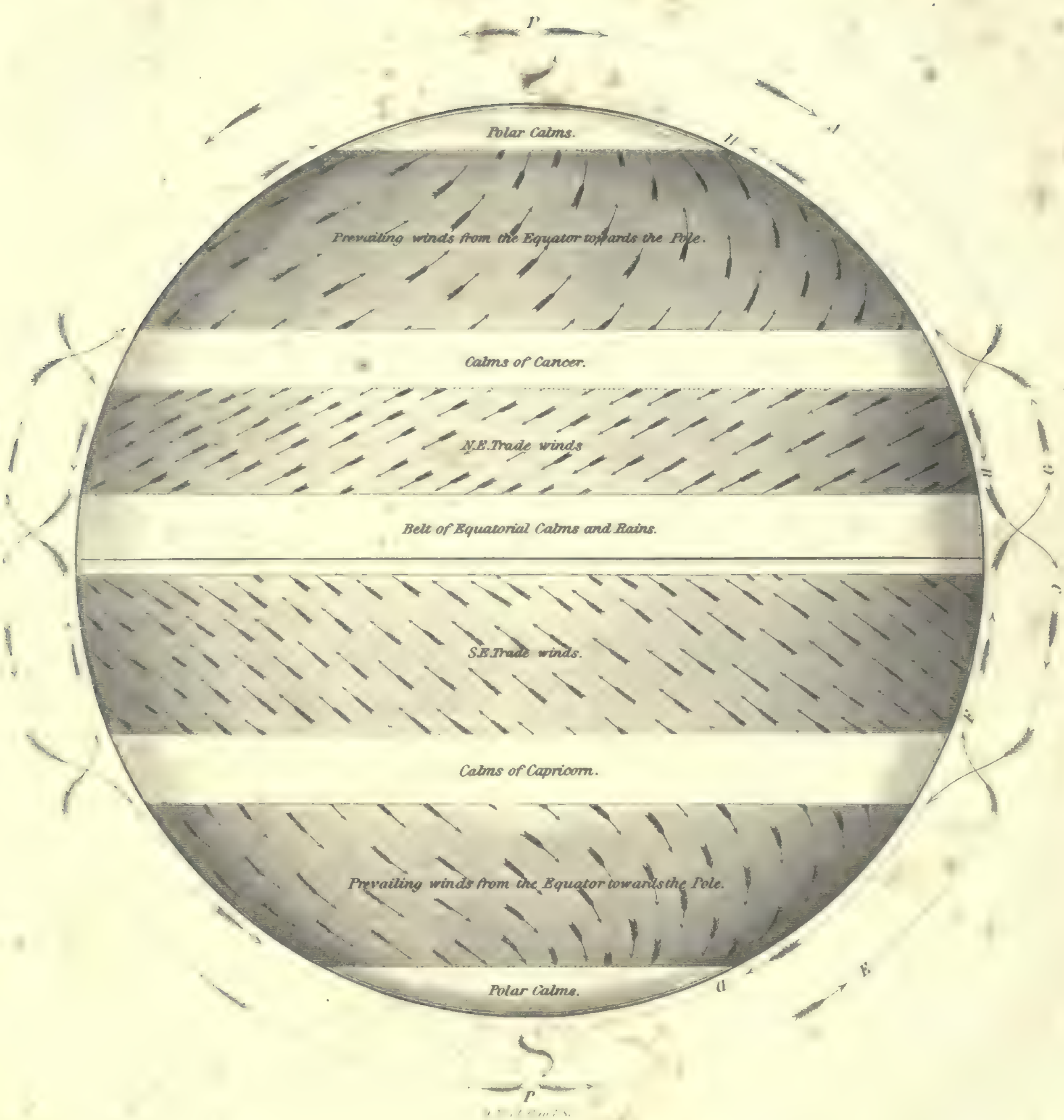
Number of sheets already published	61
Number of sheets in the hands of the engraver	20
Number of sheets projected and in process of construction	32

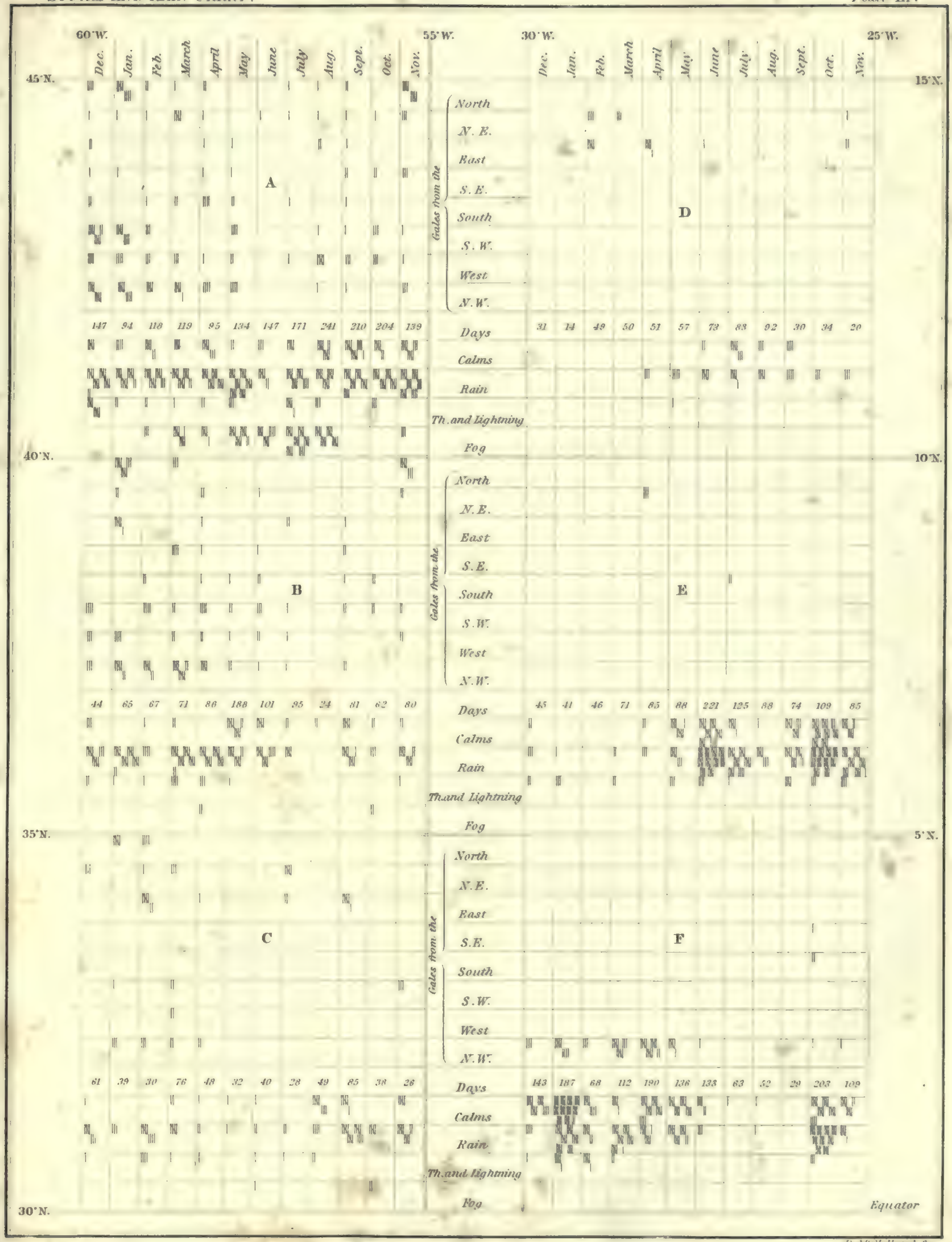
PILOT SHEET. Plate I.



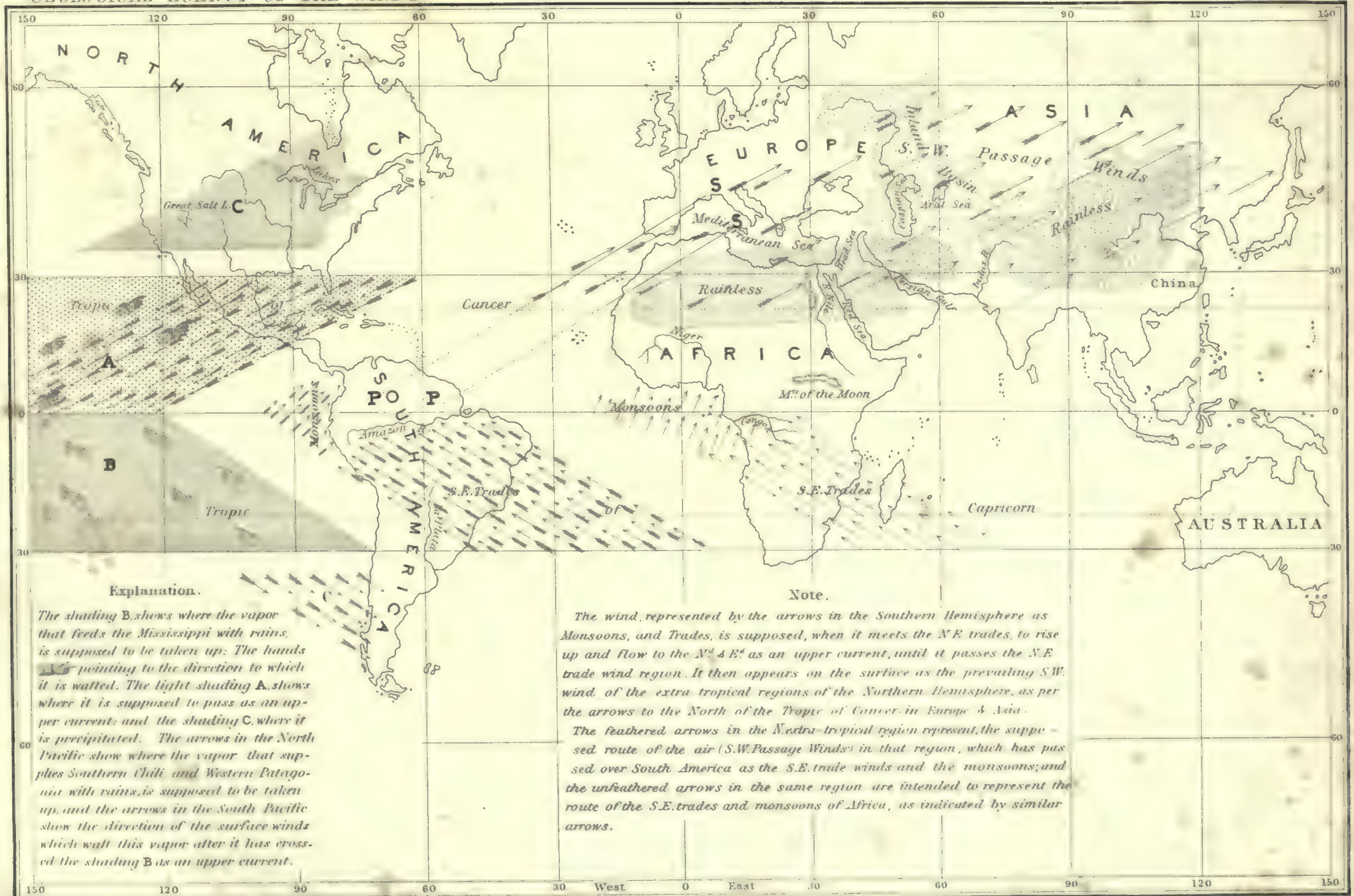
P. M'Clelland Sc.

DIAGRAM OF THE WINDS. Plate II.





P. McClelland Sc.



Explanation.

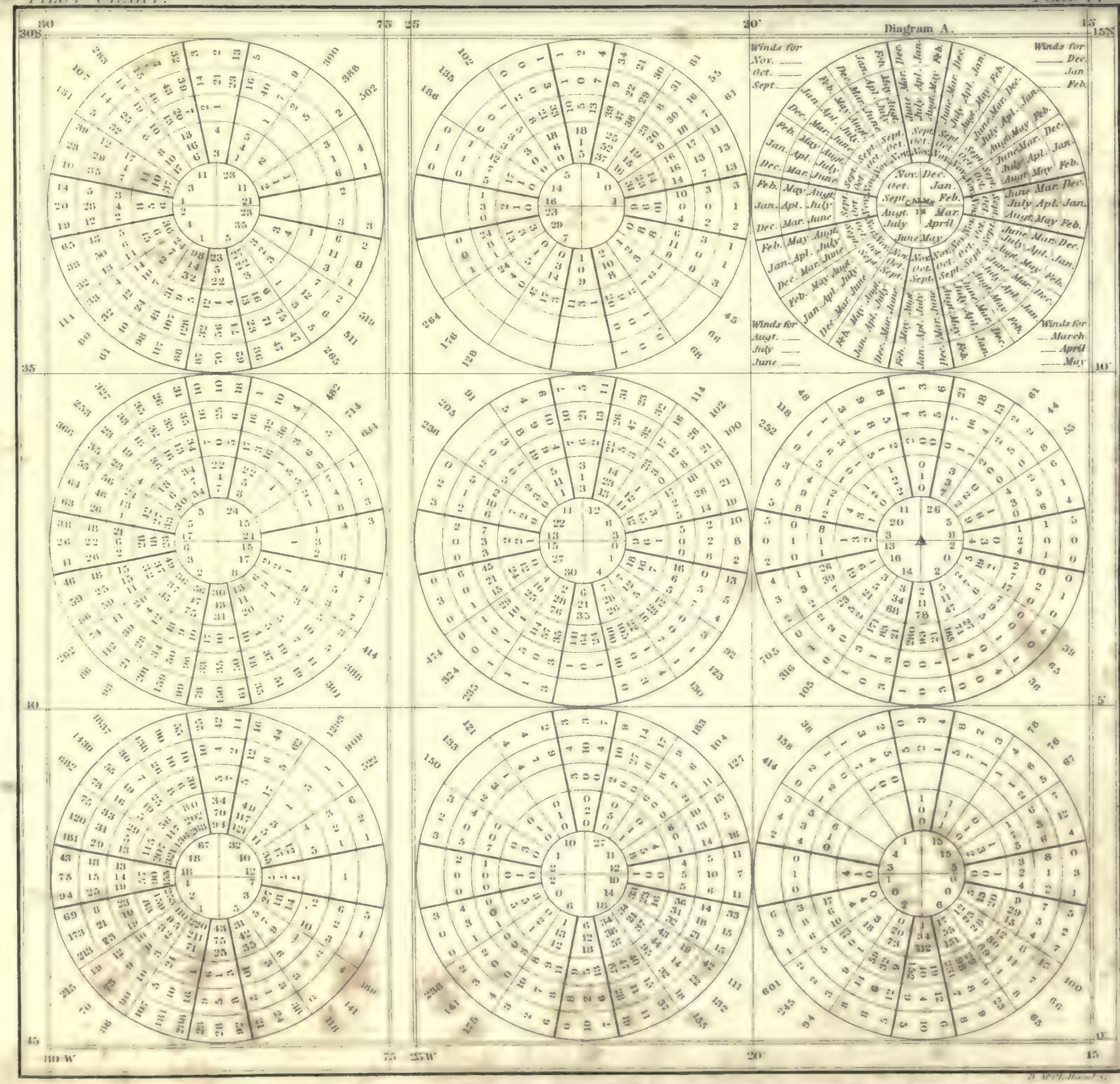
The shading **B** *shows where the vapor that feeds the Mississippi with rains, is supposed to be taken up: The hands pointing to the direction to which it is wafted. The light shading* **A** *shows where it is supposed to pass as an upper current: and the shading* **C** *where it is precipitated. The arrows in the North Pacific show where the vapor that supplies Southern Chili and Western Patagonia with rains, is supposed to be taken up, and the arrows in the South Pacific show the direction of the surface winds which waft this vapor after it has crossed the shading* **B** *as an upper current.*

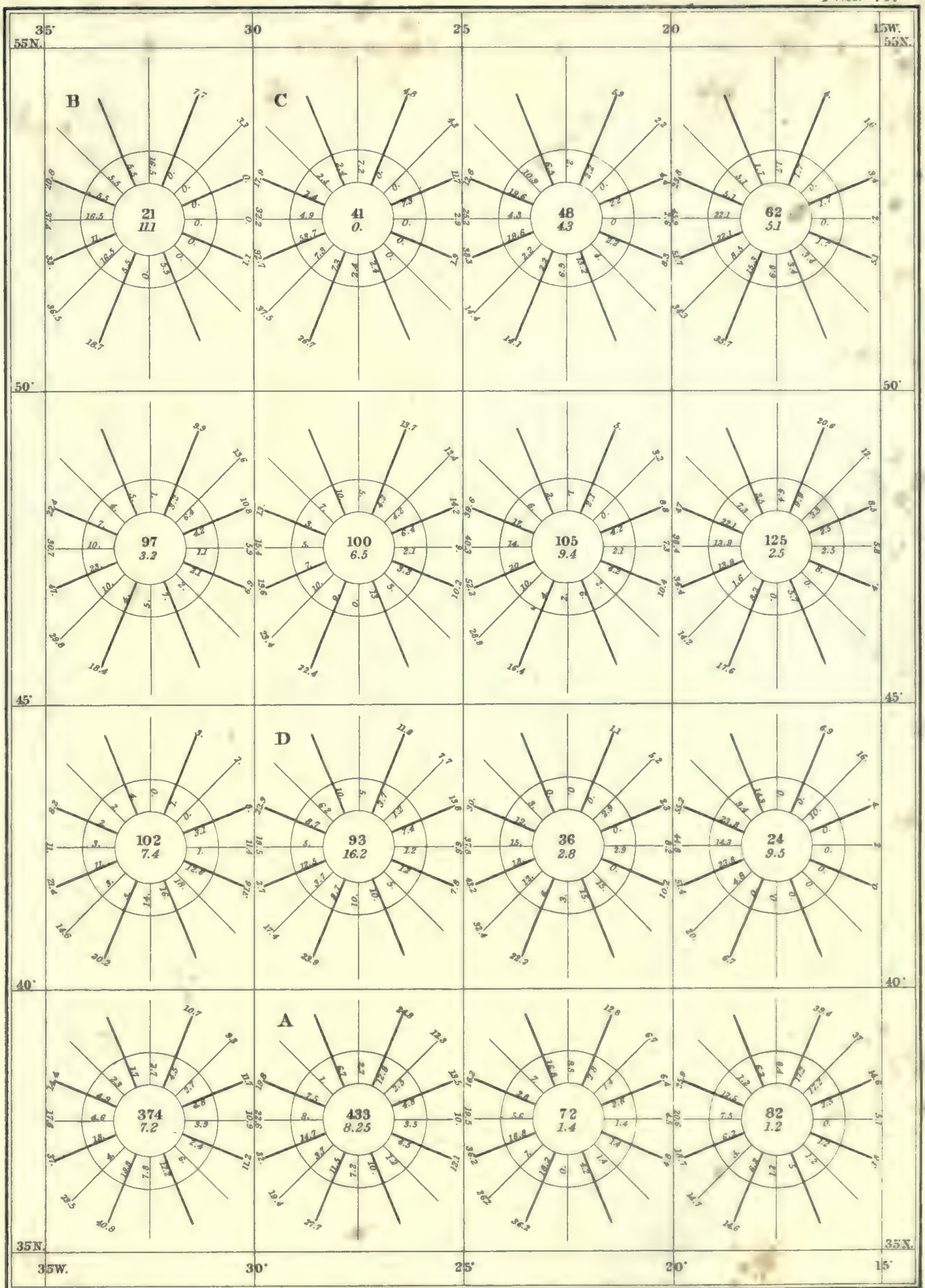
Note.

The wind represented by the arrows in the Southern Hemisphere as Monsoons, and Trades, is supposed, when it meets the N.E. trades, to rise up and flow to the Nd. & Ed. as an upper current, until it passes the N.E. trade wind region. It then appears on the surface as the prevailing S.W. wind of the extra tropical regions of the Northern Hemisphere, as per the arrows to the North of the Tropic of Cancer in Europe & Asia.

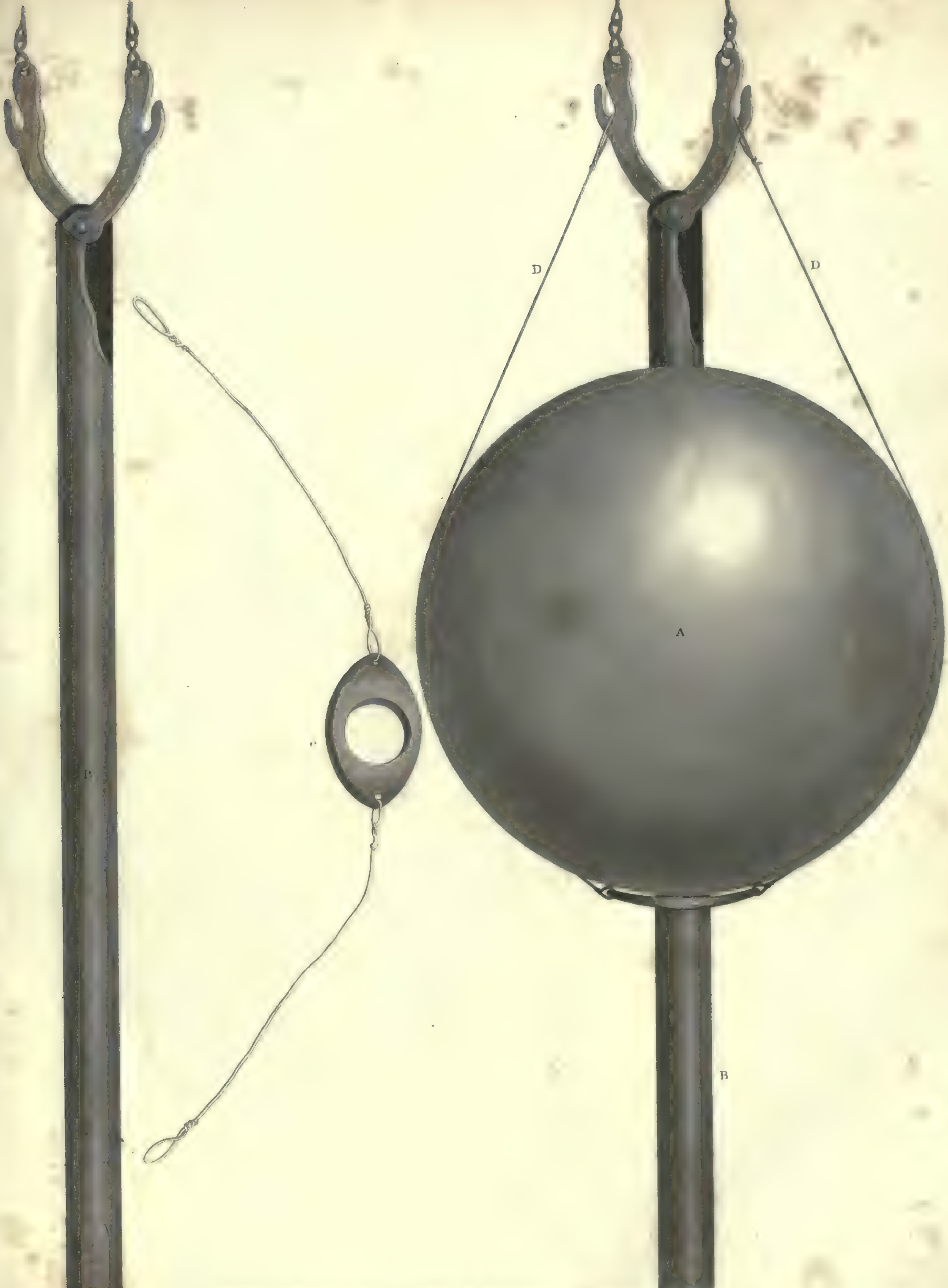
The feathered arrows in the N. extra-tropical region represent the supposed route of the air (S.W. Passage Winds) in that region, which has passed over South America as the S.E. trade winds and the monsoons; and the unfeathered arrows in the same region are intended to represent the route of the S.E. trades and monsoons of Africa, as indicated by similar arrows.

PILOT CHART. Plate I.

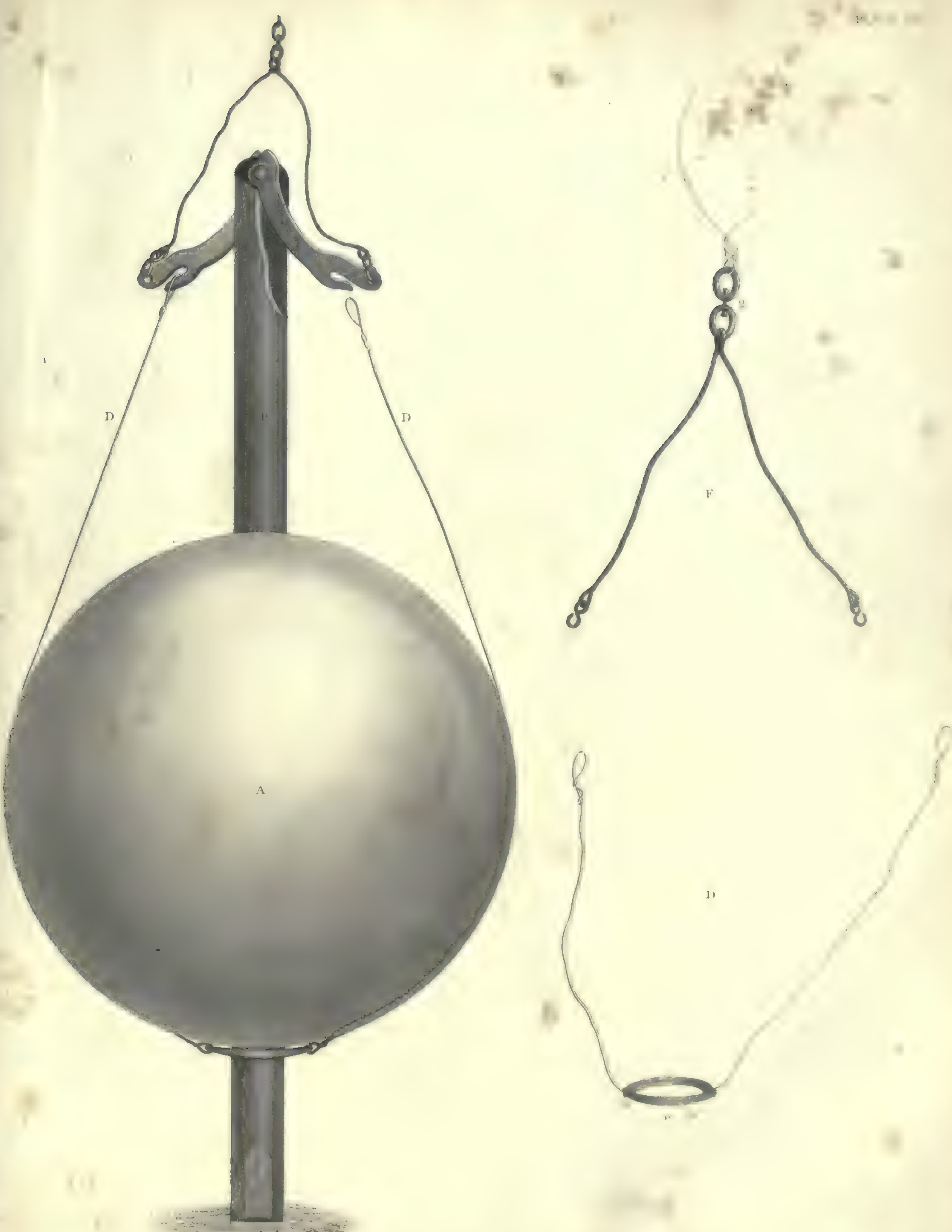




D. M'Clelland Sc.



SOUNDING APPARATUS INVENTED BY PASSED MIDS^{M} J. M. BROOKE, U. S. N.


D
D
A
F
D

WHALE CHART. Plate IX.

130° — 125° W.

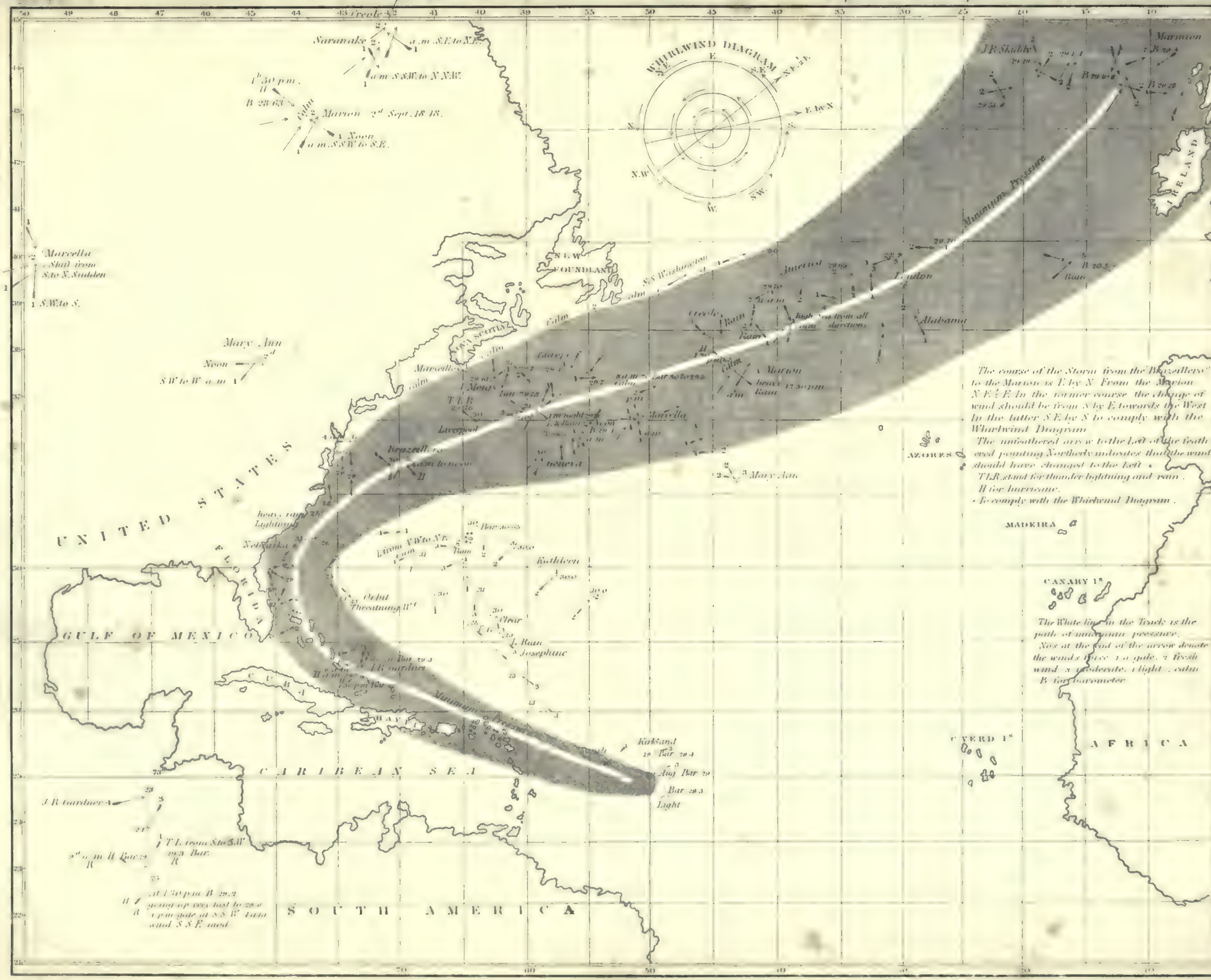
Lat. North		Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.
60° No. days of search	D												
No. days on which found whales	S R												
55° No. days of search	D									2			
No. days on which found whales	S R												
50° No. days of search	D							7		13			
No. days on which found whales	S R												
45° No. days of search	D							10	5	17	2		
No. days on which found whales	S R												
40° No. days of search	D							4	7	11	8	4	
No. days on which found whales	S R												
35° No. days of search	D										9	9	9
No. days on which found whales	S R												
30° No. days of search	D	28	7								4	[illegible]	3
No. days on which found whales	S R												
25° No. days of search	D	3		2	5		2	1	3				4
No. days on which found whales	S R												
20° No. days of search	D	4	5	6	2	5							2
No. days on which found whales	S R												
15° No. days of search	D	3	3		1	6	2						
No. days on which found whales	S R												
10° No. days of search	D	2	7	6	8	4		5	3	6			
No. days on which found whales	S R												
5° No. days of search	D	5	25	25	23	45	37	4		4	6	7	2
No. days on which found whales	S R												
0° Equator													

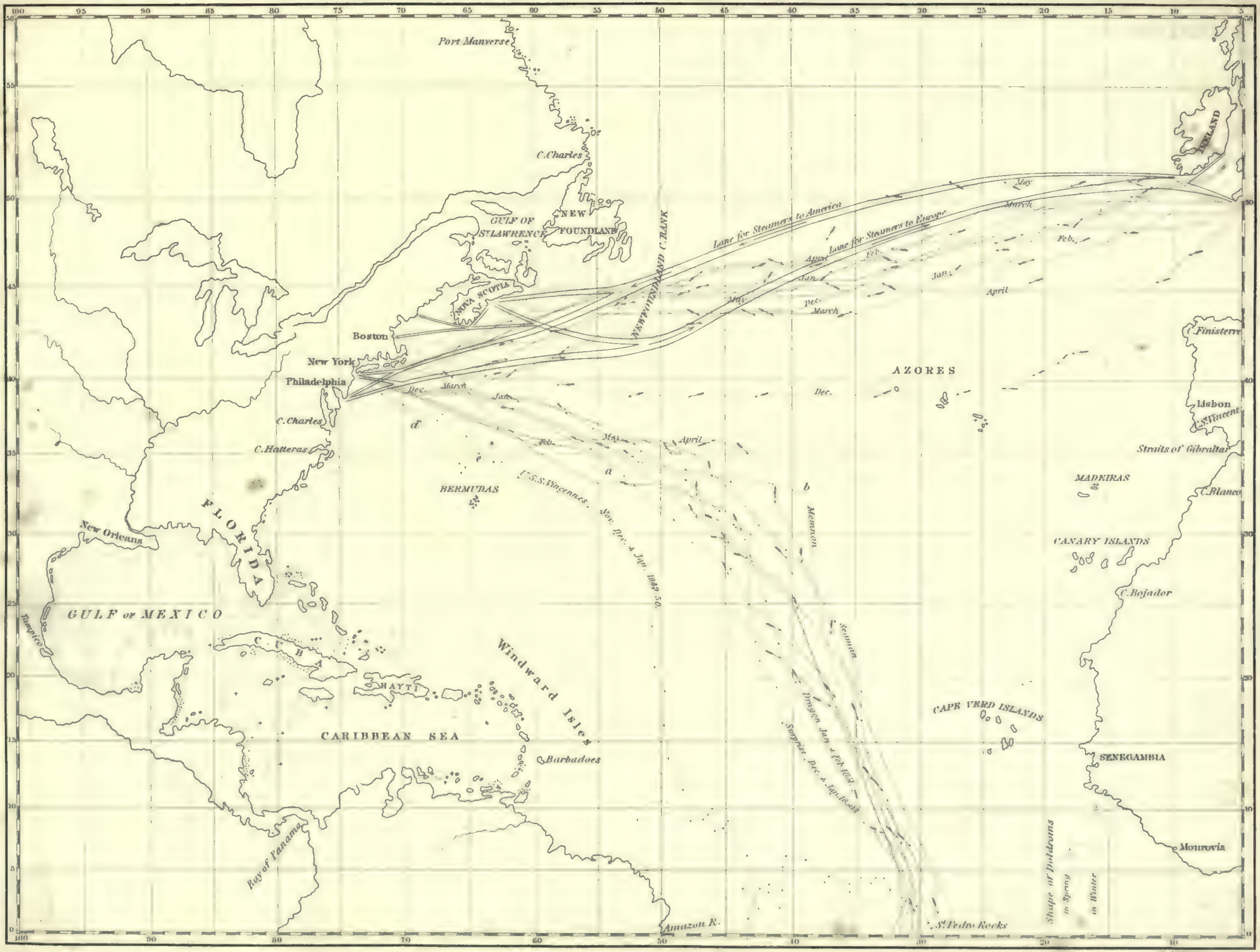
130° — 125° W.

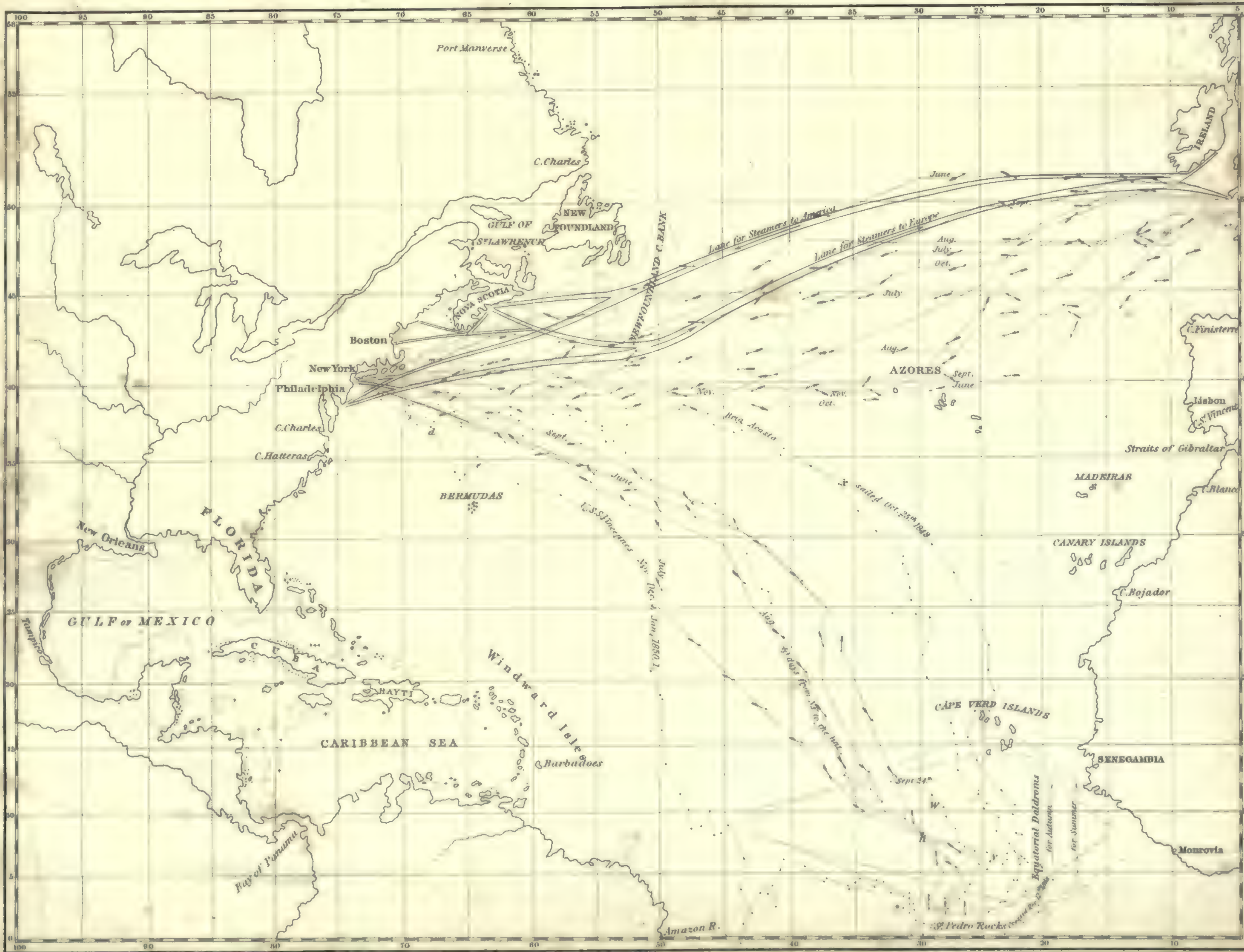
Lat. South	Dec	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.
Equator 0° D	10	89	110	85	44	74	73	82	29	10	13	8
S R												
S. Lat. 5° D	3		6	1	4		2			5		
S R												
10° D	15			8			2	3	1			
S R												
15° D	12		2	4		4	3	3	2			
S R												
20° D	11	9		8		16		3				
S R												
25° D	4	20	14		6	15	4		5			
S R												
30° D		16	7			4					2	2
S R												
35° D				3	3		2					
S R												
40° D	3	2	9	4			4				3	
S R												
45° D	7	9	12	1	1	2	3	2	2			
S R												
50° D			4	3							2	
S R												
55° D												
S R												
60°												

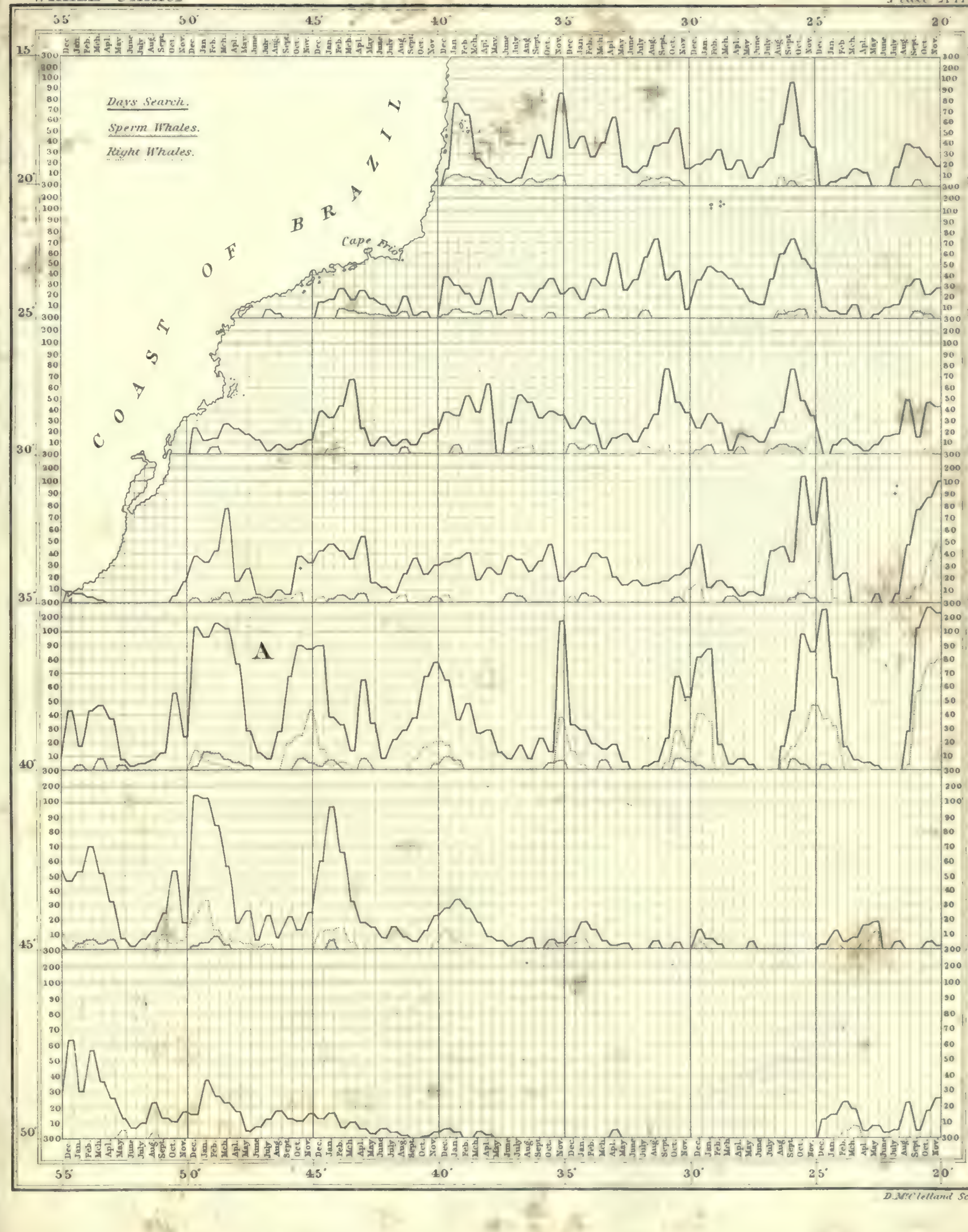
D. M'Clelland Sc.

August and September Hurricane of 1848



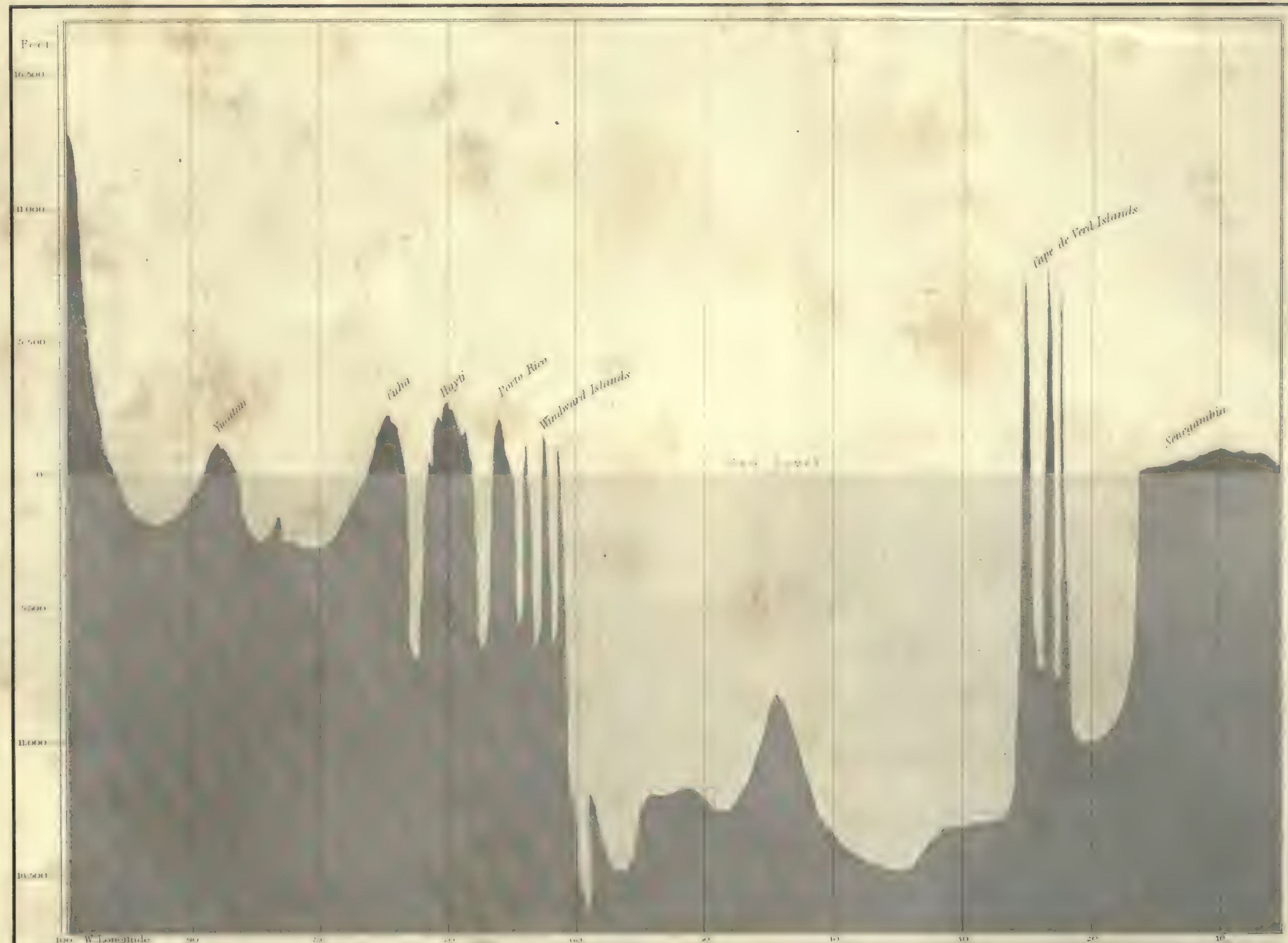

Port Manverse
C. Charles
GULF OF St. LAWRENCE
NEW FOUNDLAND
NOVA SCOTIA
NEWFOUNDLAND C. BANK
Lane for Steamers to America
Lane for Steamers to Europe
IRELAND
Boston
New York
Philadelphia
C. Charles
C. Hatteras
FLORIDA
New Orleans
GULF OF MEXICO
Tampico
CUBA
HAYTI
CARIBBEAN SEA
Windward Isles
Barbadoes
Bay of Panama
Amazon R.
BERMUDAS
U.S.S. Vincennes. Nov. Dec. & Jan. 1849 50.
Memnon
Seaman
Dragon Jan. & Feb. 1851.
Surprise. Dec. & Jan. 1849
St. Pedro Rocks
AZORES
C. Finisterre
Lisbon
C. St. Vincent
Straits of Gibraltar
MADEIRAS
C. Blanco
CANARY ISLANDS
C. Bojador
CAPE VERD ISLANDS
SENEGAMBIA
Mourovia
Shape of Doldrums
in Spring
in Winter
May
March
Feb.
Jan.
April
Dec.
D. McClelland Sc.


Port Manverse
C. Charles
NEW FOUNDLAND
GULF OF ST. LAWRENCE
NOVA SCOTIA
NEWFOUNDLAND C. BANK
IRELAND
Lane for Steamers to America
Lane for Steamers to Europe
June
Sept.
Aug.
July
Oct.
Boston
New York
Philadelphia
C. Charles
C. Hatteras
AZORES
Nov.
Brig Acasta
sailed Oct. 25th 1849
U.S.S. Vincennes Nov. Dec. & Jan. 1850. 1.
41 days from 35 to the line
Sept. 24th
BERMUDAS
FLORIDA
New Orleans
GULF of MEXICO
Tampico
CUBA
HAYTI
CARIBBEAN SEA
Windward Isles
Barbadoes
Bay of Panama
Amazon R.
St. Pedro Rocks
C. Finisterre
Lisbon
C. St. Vincent
Straits of Gibraltar
MADEIRAS
C. Blanco
CANARY ISLANDS
C. Bojador
CAPE VERD ISLANDS
SENEGAMBIA
Monrovia
Equatorial Doldrums
for Autumn
for Summer



D. McClelland Sc.


Explanation.
less than 1000 fathoms.
from 1000 to 2000 fathoms
" 2000 .. 3000 "
" 3000 .. 4000 "
(blank) more than 4000 "
Banks.
NEW FOUND LAND
GRAND BANK
NOVA SCOTIA
Boston
New York
Philadelphia
C. Charles
C. Hatteras
UNITED STATES
New Orleans
FLORIDA
CUBA
HAYTI
BERMUDAS
AZORES
MADEIRA
CANARY ISLANDS
CAPE VERD ISLANDS
PORTUGAL
Straits of Gibraltar
AFRICA
SOUTH AMERICA
Amazon R.
S. Pedro
Vertical Section on Plate XV
Rockall Bank
2000 Clay
Fig. A.



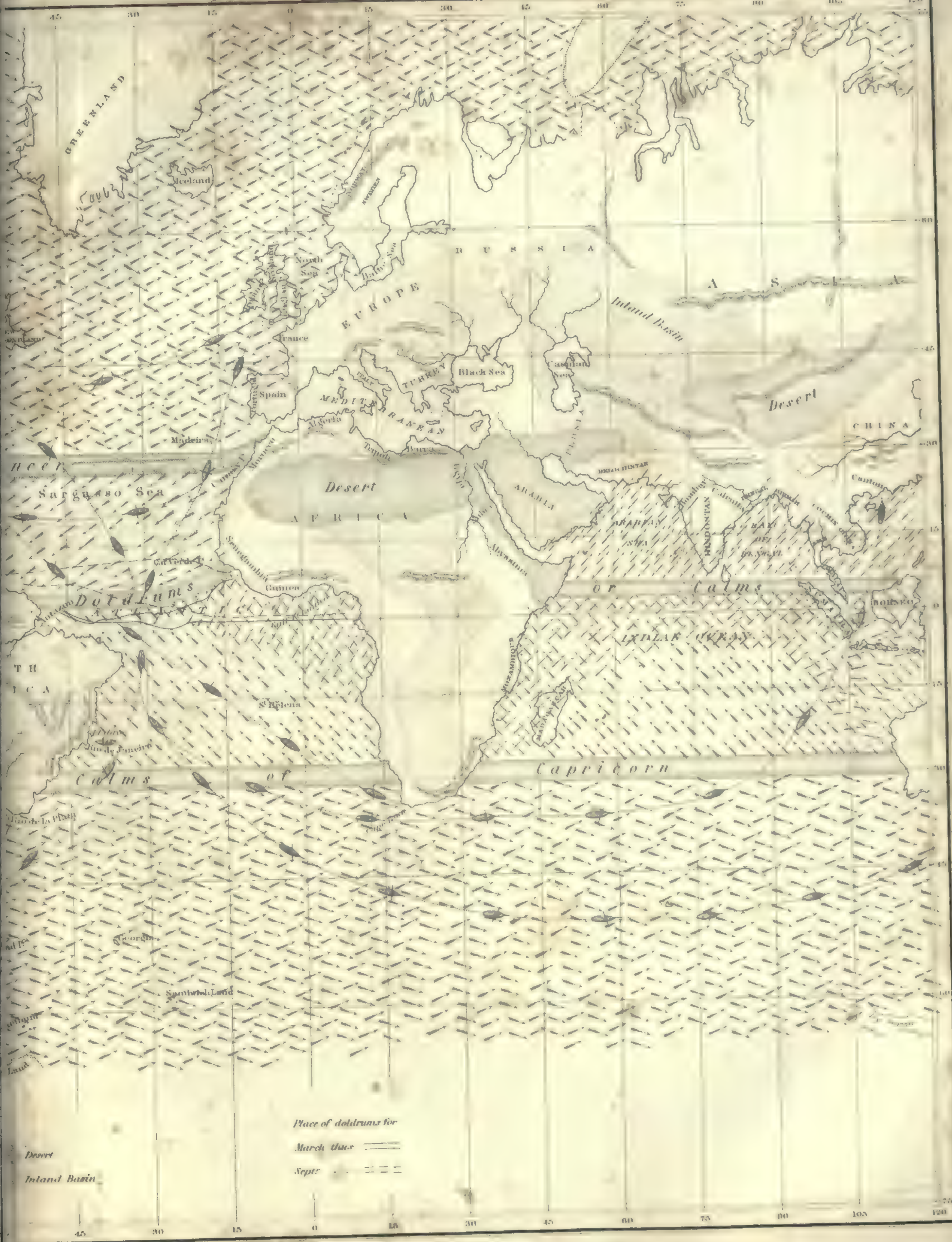
Feet
16,500
11,000
5,500
0
5,500
11,000
16,500
100 W. Longitude
90
70
60
40
30
20
10
Yucatan
Cuba
Hayti
Porto Rico
Windward Islands
Sea Level
Cape de Verd Islands
Senegambia


EXPLANATION
a _ The place of the San Francisco after the wreck Dec. 26th
o Where she was abandoned Jan. 4th
a.b Computed limits of drift
c Where the searching vessel was directed to look for her
The hot streaks of Fig. A
Direction of flow and drift
Flow, not steady in any direction
Northern limit of the Gulf Stream for Sept.
The Gulf Stream carries its northern limit to and fro over this space once each way during the year.
GRAND BANK
Limits of the Gulf Stream for the Month of March
NEW FOUNDLAND
NOVA SCOTIA
Boston
New York
Philadelphia
C. Charles
C. Hatteras
UNITED STATES
FLORIDA
New Orleans
Tampico
CUBA
HAYTI
BERMUDAS
Sea weed
SARGASSO SEA
AZORES
MADEIRA
CANARY ISLANDS
CAPE VERD ISLANDS
SPAIN
Straits of Gibraltar
AFRICA
The Great Equatorial current
Bay of Panama
Amazon R.
SOUTH AMERICA
Fig. A.
Dist. from C. Henry in naut. miles.
Temp's
Fig A. - Thermal Section of the Gulf Stream.
n Mean of 0.5.10.20 & 30 Faths
o 50.70.100 & 150
s Mean of 200.300 & 400 Faths
t 500 Faths

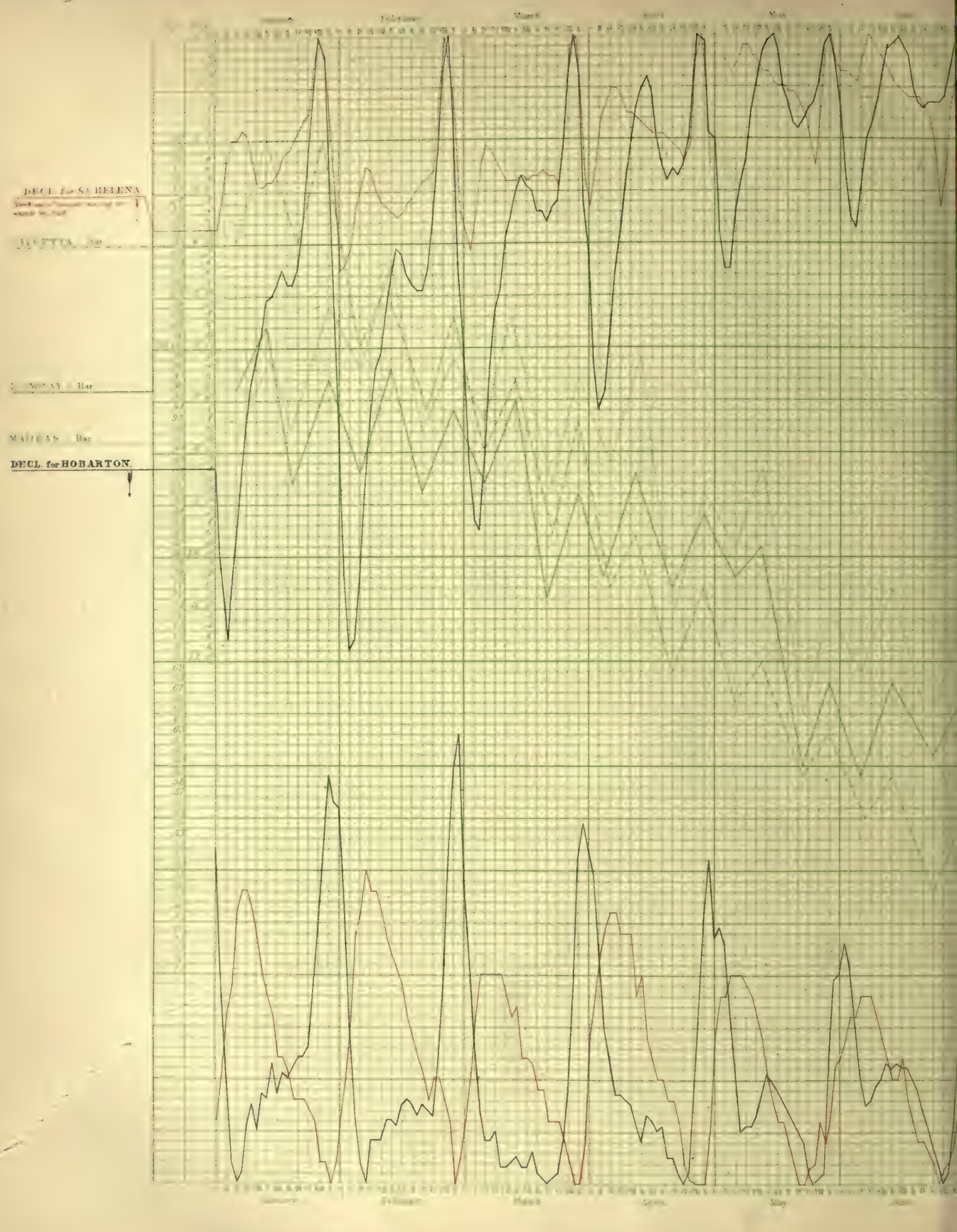
SEA DRIFT AND WHALES, on which the movements of the sea as indicated by the THERMOMETER are shewn.


GREENLAND
Iceland
Norway
Sweden
North Sea
Baltic Sea
RUSSIA
EUROPE
France
Spain
Portugal
Madeira
Canary Is.
Morocco
Algeria
Tripoli
Barca
Egypt
ITALY
TURKEY
Black Sea
Caspian Sea
MEDITERRANEAN
ASIA
Inland Basin
PERSIA
ARABIA
BELOOCHISTAN
Bombay
Calcutta
HINDOSTAN
ARABIAN SEA
BAY OF BENGAL
BIRMAH
COCHIN CHINA
CHINA
Canton
SUMATRA
BORNEO
INDIAN OCEAN
AFRICA
Nubia
Abyssinia
Senegambia
Guinea
Gulf of Guinea
C. d. Verde Is.
Sargasso Sea
ATLANTIC
Amazon
St. Helena
MOZAMBIQUE
MADAGASCAR
Rio de Janeiro
Rio de la Plata
Cape Town
Georgia
Sandwich Land
Right whale ground
Right whale ground
whale ground
Right whale ground
Right whale ground
Ice barrier

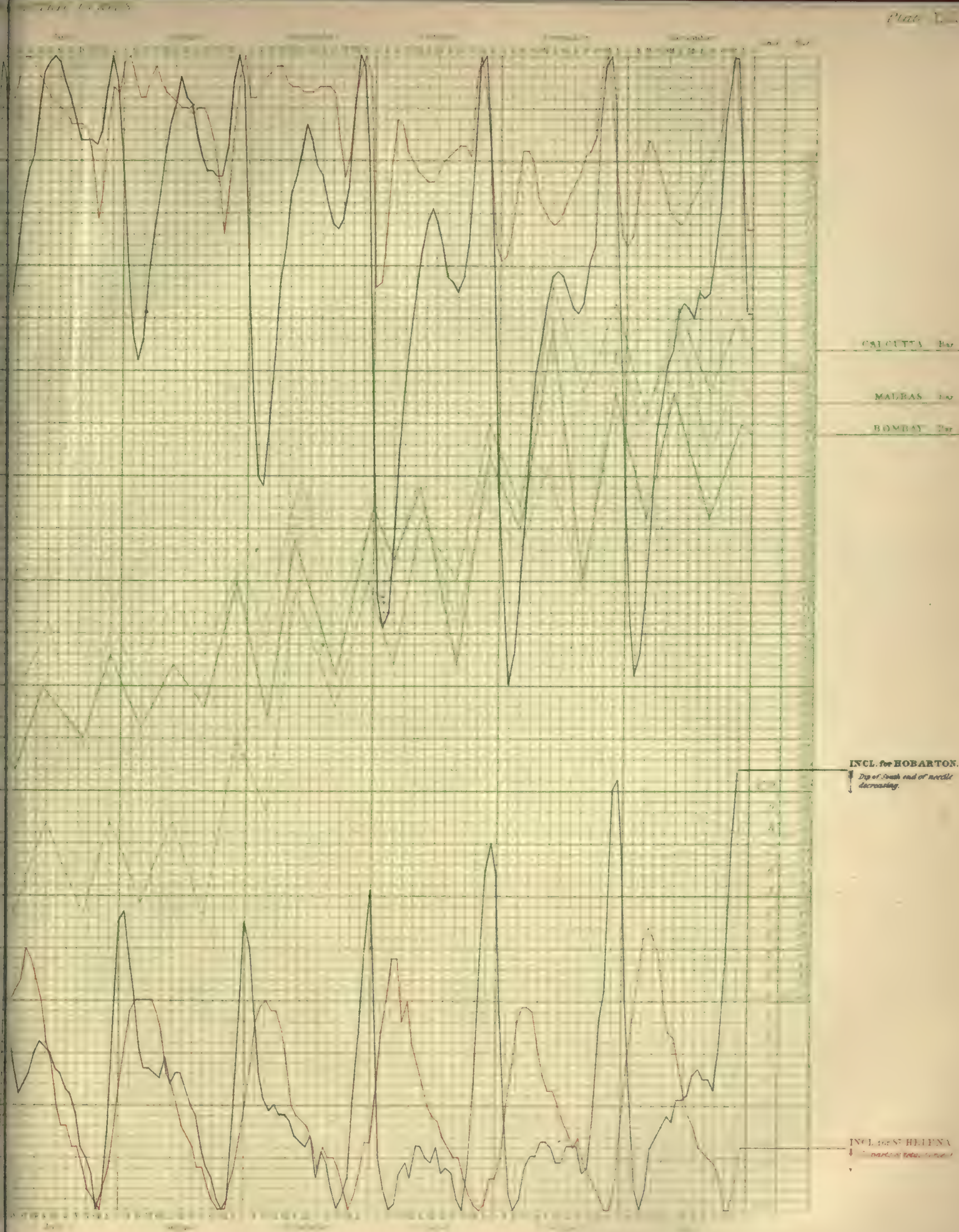

EXPLANATION
North East Trades
South East Trades
South East & South West Monsoons
North East & South West Monsoons
Prevailing Westwardly Winds
HUDSONS BAY
NORTH AMERICA
UNITED STATES
N York
S Francisco
MEXICO
Calms of
Equatorial
Belt of
Columbia
Callao
Valparaiso
NEW GUINEA
NEW HOLLAND
Port Jackson
Port Philip
NEW ZEALAND
Patagonia
To U.States & Europe
Antarctic Continent
Routes & average passage in days
Fair Winds
Head Winds


GREENLAND
Iceland
North Sea
Baltic Sea
R U S S I A
E U R O P E
France
Spain
A S I A
Inland Basin
Caspian Sea
Black Sea
TURKEY
MEDITERRANEAN
Algeria
Tripoli
Barca
Madeira
Sargasso Sea
Desert
A F R I C A
ARABIA
Arabian Sea
Abyssinia
Senegambia
Guinea
Desert
CHINA
Canton
Cochin China
HINDOSTAN
Bay of Bengal
BORNEO
Doldrums
or Calms
INDIAN OCEAN
Mozambique
Madagascar
St Helena
Rio de Janeiro
Calms of Capricorn
Sandwich Land
Georgia
Place of doldrums for
March thus
Septr
Desert
Inland Basin

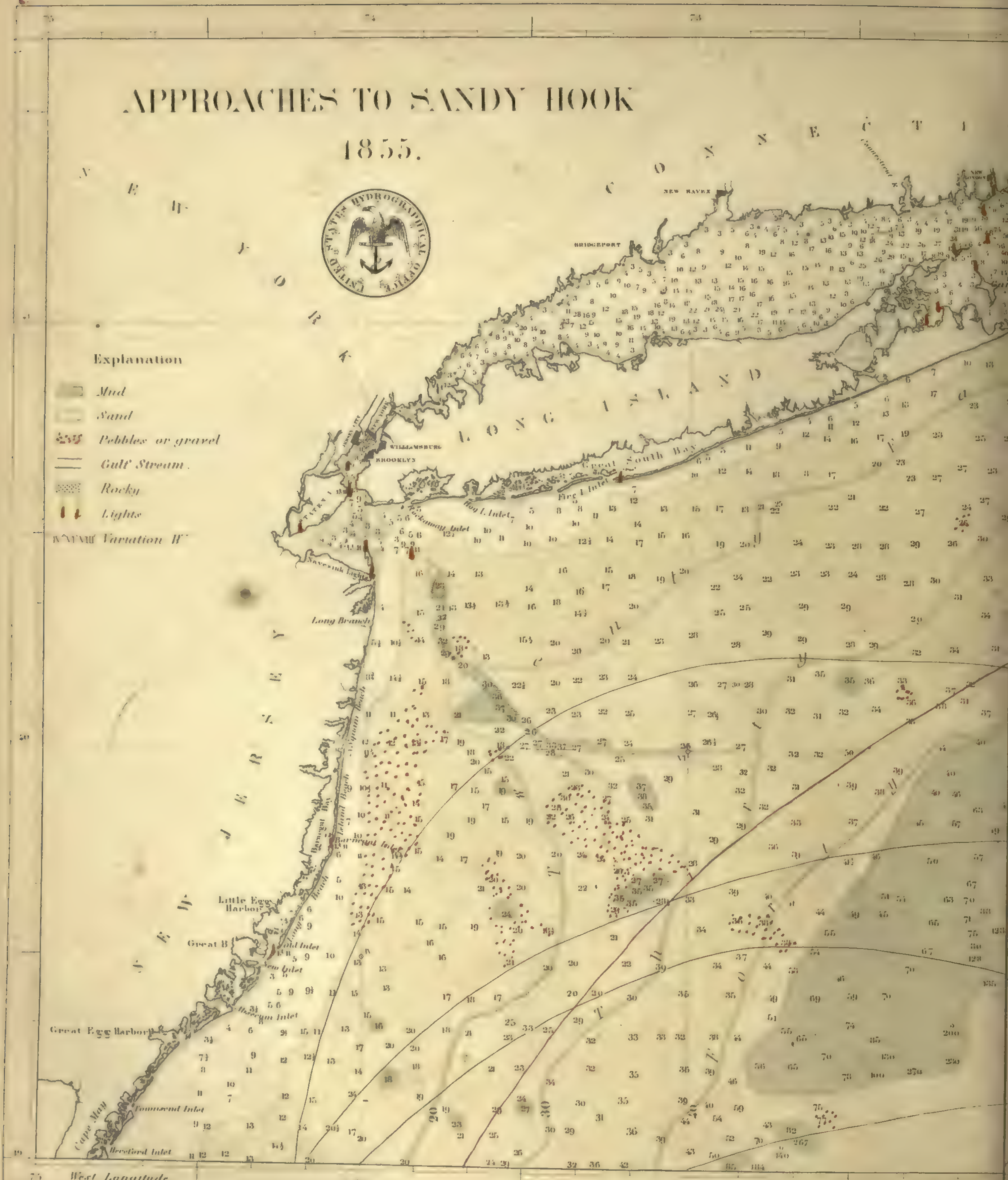

GREENLAND
ENGLAND
IRELAND
NORTH AMERICA
EUROPE
AFRICA
SOUTH AMERICA
New found land
60°
50°
70°
80°
September
March
CUBA
C. Verde
GULF OF GUINEA
C. North
R. Amazon
C. St. Roque
Congo R.
Isotherms for
March
September
Rio de la Plata
C. of Good Hope
THERMAL CHART.



DECL. for HOBARTON.



CALCUTTA Bar.
MADRAS Do
BOMBAY Do
INCL. for HOBARTON.
Dip of South end of needle decreasing.
INCL. for ST HELENA

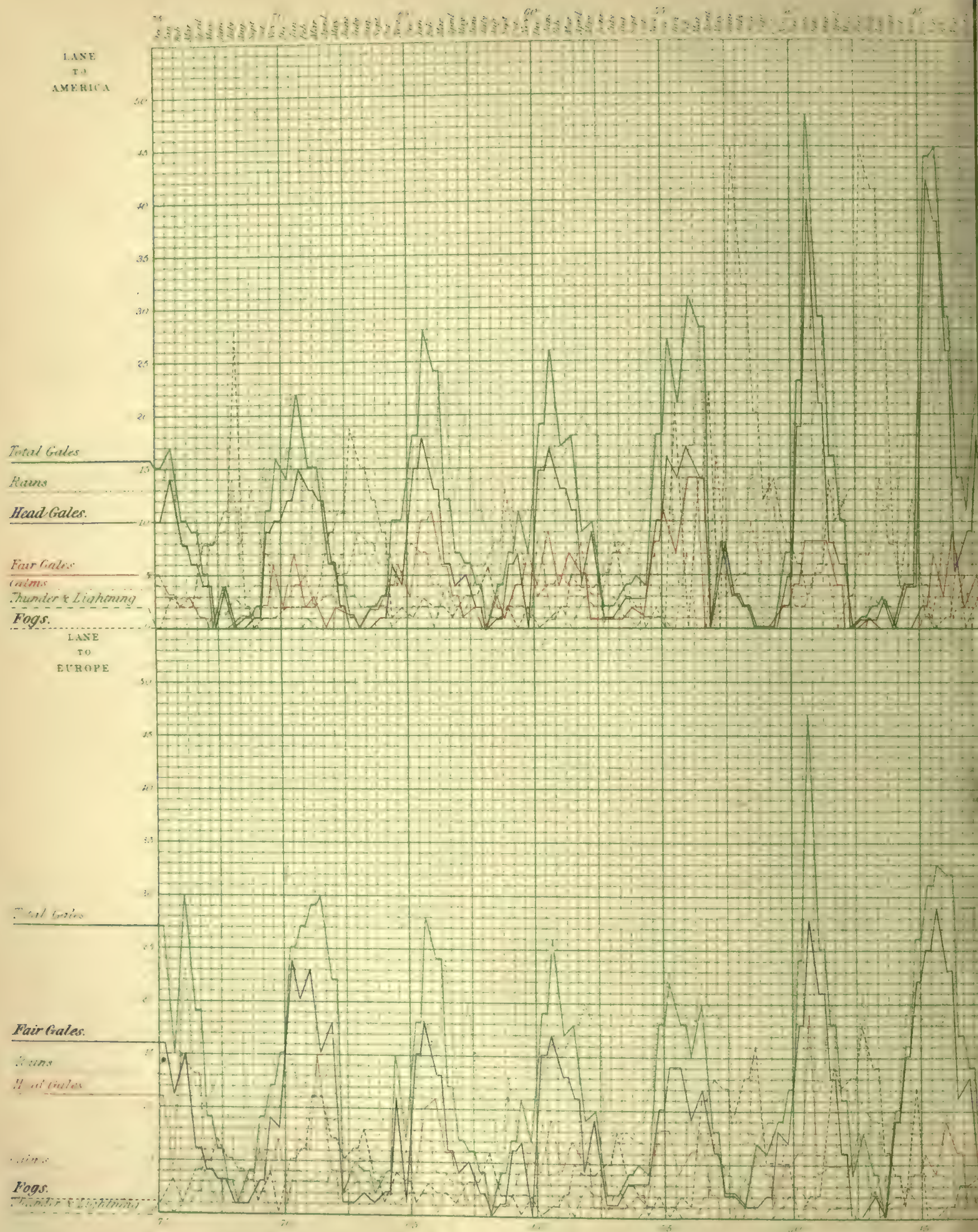


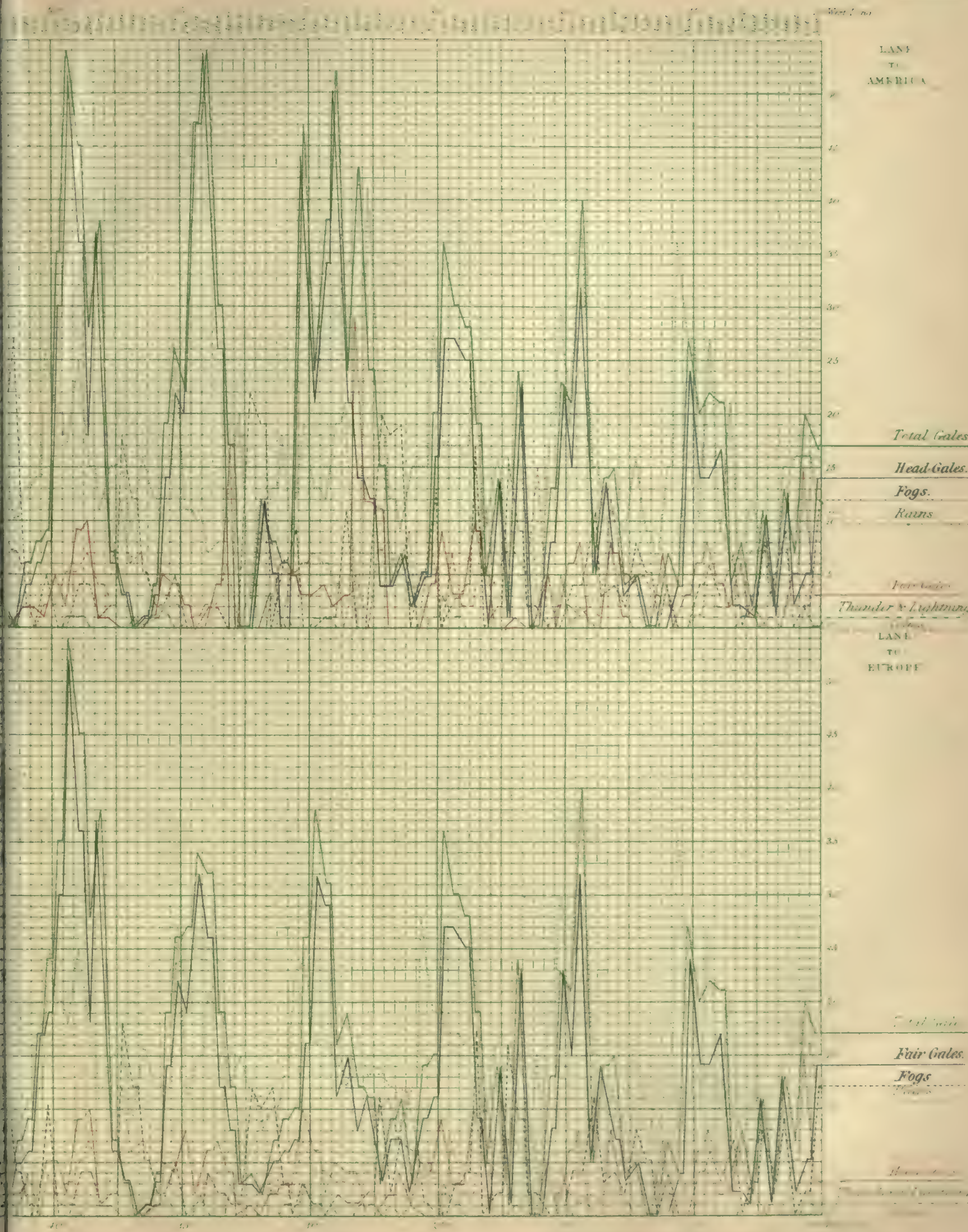
Drawn by William Flye & Lieut. B.S. Porter U.S.N.

Coast line and soundings from the Coast

...rvey and Chart of E. & G. W. Blunt 1852

Engraved by Selmar Siebert


LANE TO AMERICA
Total Gales
Rains
Head Gales.
Fair Gales
Calms
Thunder & Lightning
Fogs.
LANE TO EUROPE
Fair Gales.
Fogs.


LANE TO AMERICA
Total Gales
Head-Gales.
Fogs.
Rains
Thunder & Lightning
LANE TO EUROPE
Fair Gales.
Fogs

Abstract Log of the Ship "Garrick"

Captain C. H. Foster.

from New York to Liverpool, and from Liverpool to New York.

1854.

The Garrick was built at New York, in the year 1836 under the superintendence of E. K. Collins. Her futtocks, apron and stern frame consists chiefly of live oak and locust of great dimensions, as is also her floor timbers. The whole of the frame is placed closer together than is usual in Merchant Ships.

Her tonnage is 895 $\frac{36}{100}$ Reg. and sailing qualities fair for a full built Ship. She has performed a great deal of hard service, and in all probability is capable of doing so for some years to come. She has however in common with the other three Ships of the dramatic Line, been most shamefully neglected and allowed to go to destruction in hull and rigging. This was well exemplified on the recent winters passage from Liverpool, when rigging, blockstraps &c. constantly came tumbling about our heads, and the hull was as leaky as a sieve.

Cargo: Cotton, Lard, Naval stores, Corn, Wheat, Manilla hemp, Flour and American Cotton canvass.

Passengers 2nd Cabin, 49 adults and 6 children, principally English, from Ill. and Michigan. Several of these, females chiefly are afflicted with fever and ague.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date	Hour	Latitude.	Longitude.	Currents Direction	Currents Rate	Barometer Height.	Ther. Att'd	Therm't. Air	Therm't. Water	Form and Direction of Clouds.	*Prop of Sky Clear.	Hours of Fog A. Rain B. Snow C. Hail D.	Magnetic Variation Observed.	Winds Direction.	Winds Rate.
May	11	N. I													
	4										Hazy		Such is the selfishness of mercantile, that not one out of 50 will allow the Ship an Azymuth Compass; Thousands may be expended on embellishments.	South	Moderate
	9	N.	W.			$29\frac{82\frac{2}{3}}{100}$		58	50	Cir. Cum. N. E.	Greater part of	3 30 A.M. to 5 fog		S. by E.	Under full sail
Noon.	12	39°45'	69°00'	S.W.S	30					Cum. str N. & N.N.W.	Firmam't				
	3										Firmam't				
	8														
	4														
	9														
Noon.	12														
12th	3		Bar.	5 P.M.		$29\frac{96}{100}$		59	52	Cir. Cum. NE to NNW.				1st part South	Gentle
	8			5 A.M.		$30\frac{8}{100}$		62	60	Cir. beautiful.	Much			Middle part South	Light
	4														
	9					$30\frac{16}{100}$		62	61	Lower strata little or no motion				Latter part S.S.E.	Light
Noon.	12	39°36' ☉	66°20' ☉	S W.	27	$30\frac{16}{100}$		62	61	Hazy	Little				
13	3			Strong Currents rips	2 P.M.	$30\frac{19}{100}$		70	63					1 S. to S.S.E.	4
	8	6 P.M.						72	66	Cir. in all forms	Scatter'd				
	4	5 A.M.				$30\frac{26}{100}$		69	70	Strats N & S.E. Cum. N Cum Str to the S & SE magnifi!	$\frac{6}{10}$			From 2 A.M. to	4
	9					$30\frac{35}{100}$		71	71	Cum. N.W.	$\frac{3}{10}$			5 calm 3 E.S.E. to S.E. & East.	1 3 4
Noon.	12	40°5' ☉	63°21' ☉	E by N ½ N.	*16	$30\frac{36}{100}$		73	68	Sinus fine	$\frac{7}{10}$				
	3													F	
	8														
	4													M	
	9													L	
Noon	12														
14	3	4 P.M.				$30\frac{39}{100}$		69	64	Cir. Str. elegant varieties	$\frac{0}{10}$			F E. E.S.E. E by W.	3
	8	5. 40°25'	Tack'd Ship to S'd											M E. & E.S.E.	3
	4	5 A.M.				39		66	66	a copious dew		A 1-2			
	9		Consigned to the care of Neptune a well corked bottle containing											E.S.E. E &	4
Noon.	12		a paper to ascertain the currents of the Ocean with the usual											L E by S to E.S.E	5
	3		directions.	9 P.M. tack'd to N'd						1 A.M. to the S'd					
	8								* U.S 10 feet 64						
	4	a swell													
	9	from S.E.		Rips		39		66	68	W. a bluish green Saw	8				
Noon	12	39°31' ☉	62°27' ☉	E.N.E	21	42		70	72	*** Cirrex clouds to N.W. rapid Cum to N.W. less rapid	$\frac{5}{10}$				
15	3	2 P.M. 15 min		fine Rips		Falling		69	72	Cum. N.N.W. slow				S.E. by E. to E by S.	4
	8	4 P.M.							66					F 6 P.M. the wind S.S.E almost calm	2 1
	4	6 P.M.				39								M S.S.E ½ E.	$\frac{2}{3}$
	9	6 A.M.				30 30		64						L S.S.E ½ E.	4
Noon.	12														
	3														
A.M.	8	39°44' DR				30				Cum Str to S.W.	$\frac{9}{10}$				
9	4					30		68	64	Splendid					
10	9							70	68	Str. N'd & W.					
Noon	12	39°51' ☉	59°34' ☉	E ¾ N.	15			70	68						
	3														
	8		We have been in the Gulf Stream greater part of the 24 hours.												

*Meridian distance. ** The temp. of water under surface is 10 feet below the level Viz. Force pump.
*** The clouds come from S.E. direction, I infer is meant N.W.

Therm in use No Fahrt Corrections	REMARKS.	"SKY CLEAR" 0 Entirely overcast 10 Not a cloud to be seen

May 11th 10 A. M. departed from Staten Island, at Noon passed Sandy Hook.
" 11th 8 P. M. sharp lightnings in the S.W., N.W. & northern quarters. Threatening, shortened sail, to accomplish which had great difficulty, owing to the inefficiency of the crew. Delightfull weather. Ocean smooth; many peterels in our wake. Saw Gulf or tropical weed. Distance run 203 miles.
It is my intention, to sail on the parlls of between 40° & 41° in order to avail myself of the influence of the stream, also to avoid the ice, which by this time must be far to the Southward.
12th Weather pleasant. Ocean smooth. A little before dusk passed trough extensive streams of gulf and rock weed, trending S.S.E. & N.N.W. A solitary whale seen. Water these 24 hours continuing very green. Stormy peterels in the wake. Gulf & rock weed. Steered by compass so as to make a E ¼ N Course.
Course S. 85° E. 129 miles ☾ filled 3hrs 36min at Greenwich.
13th Pleasant tho sultry, about 4 A. M. the water from a deep green changed to a greenish blue. A moderate swell from S.S.E., rock & gulf weed, wilted grass & straws. After the moon arose, a more beautifull lunar atmosphere I never beheld. Latter part 6 to 9 A. M. a quick short undulation from South, a moderate swell from E.S.E. Passed during the forenoon a nautilus under swelling sail and with pliant oars, also a very singular looking mollusk, red as a lobster, with 5 or 6 blunt projections and as large as a middle sized turtle. When in the stream, the agitation of the current was quick and fine, W. 71° of a deep Ocean blue. When at 7 bells we emerged, W. 68° the colour became a bluish green. Course true E. by N. ½ N. distance, distance including current 154 miles. No peterels seen since yesterday afternoon.

14th 2 & 3 A. M. passed gulf and rock weed, straws and circular mollusca. Water quite green, a school of porpoises to the Ed. A dense fogbank to the Northward 4° to 5° above the horizon, it has the appearance of distant land. A solitary pair of peterels in the wake, Ocean this afternoon litterally impregnated with mollusca, also, numerous species which have the appearance of the blue bottle fly. Great quantities of weed, wilted grass, straws and fish spawn. 4 P. M. tackd to the S. by E. A species of mackrell, commonly called by sailors "skip jacks" playing near the ship. ☉ set clear, a golden yellow sky. A flock of gannets about. This forenoon is seen a dense fogbank E.N.E. round to N.N.W. All last night and this morning strong scents of wilted sea weed, such as we often smell on the sea shore. W. to noon water deep Ocean blue. Noon tackd to Northd and Ed. Course S. 86° E. Distance 69 miles. no peterels seen.

15th 2.15 A. M. Water fell to 66, the colour of a bluish green. Tackd to Southd. The fog is still seen to the Nd & Ed. 6 A. M. tackd to Ed. A delightfull morning. large quantities of gulf & rock weed, wilted grass and straws. Ocean impregnated with animalculae, the sparkling blue marine insect numerous. A gentle swell from the East. Plenty of weed. Stormy peterels in the wake. W. 9 A. M. a bluish green, at noon Ocean blue. Course N. 84° E. Distance 133 miles.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date	Hour	Latitude	Longitude	Currents Direction	Currents Rate	Barometer Height	Barometer Ther Att'd	Thermr Air	Thermr Water	Form and Direction of Clouds	Prop of Sky Clear	Hours of Fog A, Rain B, Snow C, Hail D	Magnetic Variation Observed	Winds Direction	Winds Rate
16	4					Falling									
	9	5 PM.				30 $\frac{21}{100}$				Cum to N.N.W.	$\frac{8}{10}$			F S.S.E to S.E. by S.	5
Noon	12	2 PM.		4 PM				67	69	slow					
				6 PM				67	71						
	3			2 AM		30 $\frac{18}{100}$		66	70					M. S.S.E	4 5
	8			4 AM		$\frac{17}{100}$		62	69						
	4									May be compared					
	9	AM.				$\frac{21}{}$		69	69	to tropical	$\frac{8}{10}$			L S.S.E. to S.E. by S.	4 3
Noon	12	Ocean lightly agitated													
	3	by current												The wind occasionly	
	8														
	4													comes in gentle gusts	
	9					Oscillat^g				A splendid sky					
Noon	12	40°58′ ⊙	56°24′ ⊙	N 60 E	52	30 $\frac{18}{100}$		69	66		8				
17.	3	P.M.				$\frac{18}{}$		67	65					F S.E by S._S.E.	3½ 3
	8	4 P.M.		light rip^s				66	64	Bluish green					
	4	8 P.M.						64	62	Chilly	10			M. D°	3 2
	9	30												L. S.E. to South	0 1 1
Noon	12	10 30 P.M.		Strong rip^s				60	66						
	3														
	8	4 AM.						62	64	Cum NE slow					
	4			Size of marine Insects, Mollusca & Medusæ in a tumbler of											
	9	None are		seawater as seen with the Microscope — head white, contracting											
Noon	12	perceptible		& expanding, very active, darting forward with great velocity, body opaque.											
	3	to the		quick in motion. — languid.											
	8	naked eye.		than the finest gossamer imaginable											
	4			pulsative mouvements. varieties, quick at											
	9			other forms innumerable, very minute.											
Noon	12	42°1′ ⊙	55°4′ ⊙	Imperceptible		30 $\frac{19}{100}$		71	66		6				
18.	3													F Cat's paws	0 E to E.N.E.
	8									Cir. varieties	4				
	4	P.M.						71	65						
	9													M Cats paws E.N.E to S.S.E. &	
Noon	12														
	3	5. 30 A.M.				30 $\frac{21}{100}$		66	64	Cir. Cum. beautifull forms	9			L N.E. by E. 6 P.s. to S.E. by E.	0 1 2
	8														
	4	[illegible]													
	9					$\frac{21}{}$		66	64						
Noon	12	42°18′ ⊙	54°40′ ⊙	Impercept^le											
19	3	P.M.								Overcast	0	B Some very light		F N.N.E. to S.W. E. the Doldrums	0 1 2 2
	8	7 P.M.								Lower Str. or Cum					
	4	10 P.M.	Drizzly			$\frac{26}{}$				from E.N.E.					
	9	6 A.M.				$\frac{24}{}$ falling		54	61	Whluish green	0	A 4 AM to 5.30 AM		E.S.E. then South M. Doldrums	3
Noon	12	10 30 A.M.						58	66	Sun shin^g at intervals				E to E. by N.	4
	3													L E to N.E. by E	
Noon	8	41°26′ ⊙	53°45′ ⊙	S.W. 1	15	20		69	67	Cum. from N.E.	$\frac{3}{10}$			A N.E. swell	5

Therm use Nº Fahr.ᵗ Corrections	REMARKS.	PROP. SKY CLEAR: 0 Entirely overcast, 10 Not a cloud to be seen

16. We begin to feel the swell from the E.N.E. It has continued gently the 24 hours. Passed the tail, part of this forenoon much rock & gulf weed, wilted grass & straws.* We have had the advantage of the stream the whole 24 hours. A deep blue tint with gentle ripplings. No petrels seen _ Course N 63° E. Distance 159 miles.

* These pieces of straws in general have marine vegetation grown on the ends thus:

Frequently met with on our coast.

17. The swell continued from the E.N.E. lightly. Petrels about. Ocean lightly agitated by current. At 9.30 P.M. the Aurora Borealis commenced. Colour a yellowish white, light not intense, principal coruscation & shooting at right angels with the horizon, 15° to 20°, and in a direct line to polaris. By 11 P.M. the Easterly swell has increased not higher but more rapid in motion. By ½ past 11 the Aurora had dispersed. Ocean this morning impregnated with animalculae, and numbers of the sparkling blue insect.* On examining a tumbler of this seawater with the sextant mikroscope, (a powerfull one) they appear of all shapes, some contending, avoiding and in pursuit; others in steady rapid motion, and some dormant. Likewise a species of the Molusca serpent, contracting and expanding, 9 inches in length**, a deep red from the head to about 3 inches down the body. Stormy petrels about the Ship. Course N E 46. Distance 72 miles. The tumbler of water, after remaining half an hour exposed to the suns rays, life became extinct. Petrels & gulls.

18. Calm, with indications of a continuance. A fogbank to the Nᵈ. A scule of fish, 1 & ½ inch in lenght, alongside. Numerous petrels. They utter a sort of shrill double chirp, especially in the night time. A light swell from the W.S.W. & East. Delightfull summer weather; Tedious. Course N 29 E. Distance 20 miles. Consigned to the care of Neptune a bottle with usual directions.

19. A scule of porpoises going to the S.W. Swell from W.S.W., S.E. & E.N.E. at 4 P.M a smart breeze to the northᵈ of us. Two Vessels came up at the rate of 5 miles per hour, the wind being N.N.E. Our ship lay be calmed within ½ mile of the breeze. From 5 to 8 P.M. the breeze alternately S.W. N.E. N. S.E. & East. Strong ripplings this forenoon. Current apparently setting to Nᵈ & Eᵈ. Little or no weed. At 10.30 entered into the stream. Rock & gulf weed, R.G. some wood with barnacles on it. A deep indigo blue. Stormy petrels about. Course S 41 E. Distance 69 miles

*I was unable to procure one **Apparently

Abstract Log of the Ship Garrick, Captain R.W. Foster

Date. V.	Hour.	Latitude.	Longitude.	Currents. Direction	Currents. Rate.	Barometer. Height.	Barometer. Ther. Att'd	Therm'r. Air	Therm'r. Water	Form and direction of clouds.	*Prop. of sky clear.	Hours of fog A, rain B, snow C, hail D.	Magnetic variation observed.	Winds. Direction.	Winds. Rate.
20	4	P.M.		Greatly agitat^d					64	Cum. from NE.	0	Misty		N.E.	5
	9	D°				30 18			62			A		F. to N.E. by E	6½
Noon	12	P.M.		Chilly,	very	.15		52	64	damp fog like					
	6	A.M.				29.98		58	62	fine rain		A		M. NE ½E to E.N.E.	6½
	8														
	4			Ocean											
	9			greatly agit^d		97		62	68	Cloudy ☉ shining at intervals				L E by N to E.	6
Noon	12	40°6' ☉	50°57' ☉	E.N.E.	15	98		68	68	9 A.M. Lower scud fly^g like whirlwinds	8				
21	3.30	P.M. 40°24'	50°46'	Icebergh 60 to 70ft.		„		57	62						
	4	P.M.		high					58						
	4									6 P.M. the clouds disperse.					
	9			Continued Ripps and smooth at intervals						leaving a clear but hazy atmosphere				F East, E by S. to S.E. & E by S.	6½ 6 5
Noon	12	P.M.				Rising		50	47		clear with mist	B light showery			
	3					gradually								M Varying as before	5 6½
	8														
	6	A.M.						61	68	Dark squally to S. & W.S.W.					
	9 10	„	W. very green, gulls & petrels	Divers		30 12/100		56 52	53 47	Hazy. Cum. to S.W. 10.25 W. 44°		A		L E. by S to E.NE.	5 5
Noon	12	40°32'	48°50'	E.N.E.	61				46						
22	3					Falling			48					F	
	8														
	4	P.M.						58	56						
	6	P.M. W. green	7 P.M. W. 52	Powerfull Ripps.				Chilly	51	Dark gloomy looking weather				M	
Noon	12	P.M.				29 97/100			68						
	3													L	
	8	A Bunting alighted on board													
	4														
	6	A.M.							65					F. ENE to E.	6
Noon	12											B.			
	3											B		M SE to E.S.E. & E. by S.	7
	9	A.M.				30 8/100		60	60						
	4	When out of the stream these 24 hours, the current must have been Westerly													
	9	11 Emerged from the stream, weather							50	more settled				L. E by S.	6
Noon	12	40°54' ☉	47°49' ☉	E by N.	18					Cloudy & hazy					
23	4	P.M.				30 10/100		60	55					F E by S to E by N 6.30 & 7 almost calm	6
	6	„	W. greenish			12			51	Enter^d into foggy atmosphere					
	4														
	9													M.E. ESE	6
Noon	12	P.M.							60						
	5	A.M.				30 8/100		60	65	Cum. to W.N.W.	2			L E.S.E. getting light	5
	9					10		61	60	Masses to S^d & W^d					
	10	30. Icebergh 25 to 30 feet high							52	„ „					
				Strong current rips these 24 hours											
Noon	12	42°23' ☉	47°38' ☉	N.N.W.	31	10			52		5				
		The Ice Island W. by N.													

Therm. in use No. Fahr.t Corrections	REMARKS.	"PROP. SKY CLEAR" 0. Entirely overcast. 10. Not a cloud to be seen

20. Petrels all these 24 hours. The lower scud this forenoon flying rapidly to the S.W. and whirling around in circles; fine white & fleecy Cum. also from N.E. not so rapid. Noon clouds gathering to the southern quarter. Course S. 57 E. 148 miles. A continued high S.E. & E.N.E. sea. Noon tack.d to North.d Saw yesterday afternoon (3 to 4 P.M.) two ships bound to the W.d from being in this parallel I infer they must have encountered ice far South of the homeward track.

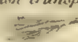
21. At 3.30 P.M. lowered temp.e of W. from 68 to 62 W. a bluish green (When in the stream, Ocean blue) Ocean now comparatively smooth). At the same time saw a large iceberg bearing North distant 12 or 14 miles. I am confident it is the melting of this berg and perhaps others, also, that gives to the water so green a tint; 4 P.M. tack.d to S. by E. in anticipation of the wind veering to S.E. 4.30 passed the junction of green & blue waters. Ripp.s like small breakers; here the W. was 62; shortly 64 & 66. We now encounter a short chop of a sea, and the ripplings of the current seemed like unto broken water. At about 20 min. to 6. P.M. the wind veered suddenly from S.E., blowing strong; tack.d ship to E.N.E. I now built my hopes upon a good run to the N.d & E.d when about 7 P.M. we emerged from the stream into green water, and to my disappointment the wind veered E. by S. & moderated. The Ocean became smooth and we entered into a chilly atmosphere. 10 P.M. a faint flash of lightning in the East. 12 P.M. tack.d to S.d & E. at 3 A.M. in the stream unsettled squally weather with a ruffled sea: Wind veering S.E. 6 A.M. tack.d to E.N.E. after running into green water the wind veered to East, moderated and the weather seemed settled. 10 A.M. a fogbank to the N.d 10.25 entered into it W. 44. At 7 bells tack.d to S.E. W. 46. Observations imperfect;* Course N. 75 E. Distance 99 miles.

22. 5 A.M. saw a whale sporting. At 7.20 A.M. entered into the current of the Stream; the margin appeared like broken water; and we immediately encountered a heavy N.E. sea, into which our Ship pitched the bowsprit. Commenced to shorten sail, but before we had succeeded, lost the jib. Such a crew of lubbers is enough to make the heart sick; 18 in number, 10 of whom cannot discriminate between the stem and the stern, and only 4 out of the remaining 8 can steer. By 10.30 A.M. the wind settled to a double reefed topsail breeze. 12 A.M. wore Ship to N.E. No doubt but that the weather to the N.d of the Stream is more settled. Petrels & porpoises; Course N. 64 E. Distance 54 miles.

23. Numerous stormy petrels. 6.30 A.M. wind E. by N. tack.d to S.d & E.d A high sea from S.S.E. & E.S.E. Ship pitching heavily. 5 A.M. tack.d to N.E. At 10.15 A.M. saw an iceberg bearing N.N.W. distant 10 miles. Petrels & gulls, very little weed. A high S.S.E. sea.
Course N. 75 E. Distance 90 miles. Invariably more settled when to the North of the Stream.

* The altitudes per sights and at meridian are not to be depended on.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date. V.	Hour.	LATITUDE.	LONGITUDE.	CURRENTS. Direction	CURRENTS. Rate	BAROMETER Height	BAROMETER Ther. Att'd.	THERM'R Air.	THERM'R Water	FORM AND DIRECTION OF CLOUDS.	*PROP OF SKY CLEAR.	HOURS OF FOG A RAIN B SNOW C HAIL D	MAGNETIC VARIATION OBSERVED.	WINDS. Direction.	WINDS. Rate
24.	4	P.M.							53		3				
	9													E. E.S.E. to E.N.E.	5
Noon	12	First position  colour a delicate blue	Neck expanding & contracting 2d position												
	4	A.M.	Mollusk.			Falling			53			B Light showers		M. E by N. to E. & E.S.E.	5
	7	As seen in a tumbler of seawater this forenoon The white headed —o cluster not seen. Slow.				30 $\frac{60}{100}$		62	61						
	4	Innumerable quantities of other animalculæ, but too minute for the Microscope at least to obtain the forms.								Cum from E.S.E. or	Nimbus				
	9					30 $\frac{2}{100}$		61	61	Light rain				L. E.S.E. light	5 4
Noon	12.	43°19′ ☉	46°58′ ☉	N63E	24				63	Squalls to Sd & Ed	4				
25	3	30 min P.M. As seen this afternoon	spirally streakd with white and a deep yellow						53	Chilly Beautifull Cum Str.	6			E. E.S.E. to East	4
	8	jet black  Mollusk transparent.	 like fins in motion							in the S.W.					3
	4	P.M. Molluscæ  immense quantities in rapid motion				29 $\frac{[illegible]8}{100}$			50						
	8								53		almost cloudless			M East to E.S.E. & E by S.	2 2½
	6	A.M.				98		54	52						
	3													L. E by S. to E.S.E. & S.E. by E. variable	2½
	8														
	4		W. blue												
	9	A.M.						56	52	Cum Str. splendid in					
Noon	12	44°4′ ☉	46°33′ ☉	N. by W.	97	Rising		61	58	Sd & Wd	9				
26.	4	P.M.	W. green			30 $\frac{1}{100}$			56					F. E.S.E. to S.E. by E.	3
	8	"						60	57						
	5	A.M.						57	57						
	9													M. E.S.E.	3
Noon	12														
	3											A from 6 to 7.30 A.M.		L. E.S.E. to East	3½
	8														
	4														
	9	A.M.				30 $\frac{2}{100}$		60	58	Cum to Sd beautifull	9.			East to E by S.	3½
Noon	12	45°6′ ☉	46°38′ ☉	S69W	33					golden yellow.					
27	3									Nim Cum from E.S.E.					
	8														
	4	P.M.				$\frac{1}{100}$		60	58		9				
	9					29 $\frac{98}{100}$						A little white		F. E to E by S.	3½
Noon	12														
	3											B from 8 until 10 P.M.		M S.E. to East & E.S.E.	2½ 2
	8														
	4														
	6	A.M.							58						
Noon	12														
	3														
	8														
	4														
	9	A.M. W. bluish green				29 $\frac{96}{100}$		64	56					L. E.S.E. to S.E. & calm	2
Noon	12	44°3′ ☉	45°56′ ☉	W.	10	95.									
	3.									Peterels				Noon S.S.E.	2½
	8														

from New York to Liverpool. 1854.

Ther in use No. Fahrt / Corrections	REMARKS.	"PROP SKY CLEAR." 0 Entirely overcast. 10 Not a cloud to be seen

24. A tumbling swell from S.W. Towards evening the wind fell almost to calm, veering to N.E. 7.30 tack'd to S'd & E'd 7 A.M tack'd to N.E. No gulf weed seen, little rock weed. Petrels in the wake. At 10 A.M passed a curious looking mollusk 12 to 14 inches in diameter

Variegated brown. A swell from S.W. Course N.30°E. Distance 66 miles. W. deep blue.

25. 7 Bells 7 P.M tack'd Ship to S.E. A continued S.W. swell, quick not high. 4 A.M tack'd to N.E. S.W. swell continues. W. blue.

Polyps innumerable quantities, also several jet black animalculæ, as seen in a tumbler of Seawater this morning. 1 active, transparent, lower part of head white, body rather opaque. I saw it distinctly swallow a white substance. 2 several, beautifully variegated. 3 Protuberances transparent white, body bluish opaque, dormant.

Delightfull weather; a large school of blackfish & porpoises. Course N. 22°E. Distance 51 miles; little or no weed.

4 P.M. 1

without animation. It looks like a sprig of coral, deep red with transparent globules and purse attached. 2 a crab, quick in motion, yellow. 3 Head black, body yellow, sluggish. 4 active, head black, yellow body. 5 Dark blue, dormant. Many jet black.

26. A continued swell from the S.W. & South, also from E.N.E. long, rolling. Saw this afternoon a large shark, also a right whale nearly ahead of our Ship, lying on its side, with one fin and one fluke of the tail out of the water. This animal was either sick or wounded, as it manifested much uneasiness. Our Ship ran against it, which seemed to take it by surprise. It sank with considerable effort, and after getting astern came to the surface, where it resumed its former position of body.

7.30 A.M tack'd to S.E. W. bluish green. Fogbanks to N'd from E. to N.N.W. Course true N.57°W. Distance 63 miles. Heading up N.E. & N.E. ½ N on starboard tack & S.S.E. on port tack. Neither rock nor gulf weed. Petrels.

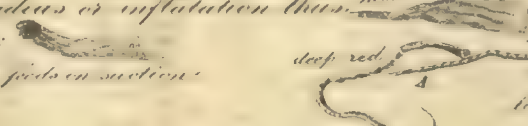
A. Several of different sizes ½ to 2 inches in lenght in a single tumbler of water, mouth expanding & contracting, yellow stripes irregular, other parts light blue.

Head yellow, body transparent white, pulsative movements.

In every tumbler of water examined the species of mollusca are numerous and in general move with great velocity. Those which I delineate are not the one millionth part of creatures seen in a single tumbler of seawater.

A. In a very protracted examination this afternoon, I discovered, that these are capable of an expanded radius or inflatation thus:

also the entire body and head with a mouth, thus:



As seen this afternoon, in a little white, A sank to the bottom of the tumbler & remained motionless.

27. Ocean smooth, swell from N.E. & S.W. Clear close to the Western horizon; all other parts overcast. The sun set in an eclipse forming a crescent. Latter part rock & gulf weed. A rippling swell from S.E. 11 A.M saw a Ship to the South'd with a southerly wind, sails full. At 11.30 a light breeze from S.E. Course S.E. Distance 69 miles.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date.	Hour	LATITUDE.	LONGITUDE.	CURRENTS Direction	CURRENTS Rate	BAROMETER Height	BAROMETER Ther. Att'd	THERM'R Air	THERM'R Wat'r	FORM AND DIRECTION OF CLOUDS.	*PROP OF SKY CLEAR.	HOURS OF FOG A RAIN B SNOW C HAIL D	MAGNETIC VARIATION OBSERVED	WINDS Direction.	WINDS Rate.
28	4	P.M.							56	St. very low from	5				
	9									S.E. derived from fog		B. Heavy in showers		F. SSE.	3 2
Noon	8 to 12					Falling				nimb rapidly from S.S.W.		from 8 to 12 P.M.			0
	6	A.M				29 82/100		61	59					M. Southerly	0
	8	From indications given by throwing over a ball of wet ashes the current on surface sets to												First Part Lat. Last M.R.	2
	4	S.&E.d I have frequently seen this tried on a voyage to India, but never had much faith													
	9									in its correctness. In same measure				L. S.W. to W.S.W.	2 & 0
Noon	12	44° 31′ ☉	41° 56′ ☉	S. 74° W.	18			62	60	I think it may be depended upon.				Calm, calm.	
29	3											Wood ash is the best.			
	8	P.M. Bluish green							60						
	4	A.M	Ocean blue			29 24			62						
	9					29 27		63	63			B. light shower		F. S.S.W. to S.W. by S.	0 3
Noon	12	45° 27′ ☉	41° 32′ ☉	N. E. 7	faint					Cum going to N.E.	3				4
	3											B.L.S.		M. S.W. by S.	5
	8														
	4														
	9													L. S.W. by S. to S.W.	5
Noon	12														
30	4	P.M. W.	Bluish green			30		66	61	Cum going to N.N.W.	9			S.W. to S.S.W.	5
	8									Cum beautifull reflection.					
	6	A.M. W.	Light bluish green			30 1/100		62	60	Cum elegant.	9				
	9													F. SS.W. to S.	5
Noon	12														4
	3	Passed great current rips these 24 hours.										B. One shower		M. South	5
	8														
	4														
	9					30 8/100		64	63	Cum from S. by E.	9			L. South S. by E.	5
Noon	12	46° 39′ ○	37° 13′	Easterly	15	9									
31	3	Colour of W. a light				11		66	62					F. S. by E.	5
	8	P.M. green. Ocean smooth						64	61		9				
	4														
	9													M. S. by E.	5
Noon	12													to S.S.E.	
	5	A.M. W.	dark blue.			12		60	59	Mass^s of cum like	2			L. S.S.E. to S. by	5
	8									fog from S.S.W. & S.S.E.				E. ½ E.&	
	4														
	9	A.M.				12		60	59	Ditto ☉ shining				S.E. by S. strong	
Noon	12	18° 20′	33° 38′ D.R.							at intervals/from S.S.E. O					
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														

*Wood ash is preferable.

Ther. in use No Fahr. Corrections	REMARKS.	"PROP. SKY CLEAR" 0 Entirely overcast 10 Not a cloud to be seen.

May 28. Ocean smooth, bluish green with a swell from the Eastward. Much rock weed, little gulf weed. Many * Nautilus with inflated sail and pliant oars; quick undulations coming from the S.E. & S.S.W. Course N.60° E. 36 miles. Peterels. Saw a piece of wood thickly coated with barnacles, also two large sharks.

*. More properly speaking Polypus.

29. A scoule of black fish, going to the N.W. Saw a Diver. Passed much rock weed. Nautilus &c. two sharks alongside. No weed to be seen. (P.M.) A gentle swell from S.E. & E.N.E. passed some rock weed. A very large shark passed close to the Ship. Very pleasant weather. Course N.69° E. Distance 155 miles, Peterels; and as usual; gulls.

30. Ocean smooth, weather delightfull. Some rockweed. Saw a large whale lashing the water. Saw one piece of rockweed this forenoon. No Peterels. Saw another large shark. Ocean very smooth without any perceptable swell, a very uncommon occurrence in this part of the Atlantic. Weather exceedingly pleasant. Course N.74° E. Distance 197 miles. Latter part no peterels seen; a faint Aurora last night.

31. Passed some rockweed this afternoon. No more stormy peterels seen. A copious dew; the lofty sails saturated. Gentle undulations this morning from East, indicating that the wind a short distance ahead is from that quarter. We passed yesterday afternoon two Vessels bound to the Westd with studding sail booms rigged out on the Starboard side. Gloomy looking to the Eastd. Course N.62° E. Distance 181 miles.

Threw over a well corked, sealed & wired bottle, with the usual request. No more weed seen.

I continue daily to observe Mollusca & Medusa, many of which differ from others, according as the Ships position on the Ocean is changed. Considering that the rude drawings with the pen might be out of place in this Abstract, I have discontinued them. I will however transmit to my Friend Lieut. Maury a series of coloured drawings of all I have seen worthy of attention with the microscope, and with appropriate remarks &c.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date.	Hour	LATITUDE.	LONGITUDE.	CURRENTS.		BAROMETER.		THERM'R.		FORM AND DIRECTION OF CLOUDS.	*PROP OF SKY CLEAR	HOURS OF FOG A RAIN B SNOW C HAIL D	MAGNETIC VARIATION OBSERVED	WINDS.	
				Direction.	Rate.	Height.	Ther Att'd	Air.	Wat'r.					Direction.	Rate.
VI.		N.	W.												
1	1	P.M.				30 12/100		58	57	Wintry looking	0				
	9									weather				F. S.E. by S. to S.S.E.	5
Noon	12										0			S.E. by S.	average
	3													M. S.E.	5
	8														
	6	A.M. W.	a light green			13/100		52	54	Cum from S&E a high	2				
	9					15		54	55	swell from E.S.E.	5			L. S.E. to S.E. by E.	5
Noon	12	50° 9′ ☉	31° 7′ ☉			. Weather pleasant			55		6			average S.E. ½ E.	
2	3													F. S.E. by E.	5
	12	P.M.									0			S.E.	3
	6	A.M.			falling	18		51	52	Cum. slow from	0			average S.E. ½ E.	
	9					30 16/100		54	52	N.E.	2			M. S.E. ½ E. to East	3 2
Noon	12	50° 40′ ☉	Imp. 30° 34′	S.W.	12	15				Atmosphere clearing	1				3
	3													L. East, varying to E.S.E.	3 2 0
	8														
	4														
3	5	P.M. Almost calm				30 18/100		52	52	Cloudy; a yellow	0				
Noon	12									clear streak to West^d					
	6	A.M.				30 5		52	52	Various strat. stationary	6			F. E.S.E. E variable	0 2 3
	8														
	4														
	9					30 7/100		53	53	Cir cum from S	6			M. East to S.E. & S by E	3
Noon	12	51° 11′ ☉	29° 27′ ☉	a slight southerly				56	53	Cum from S.S.E.					
	3													L. S. by E.	4
4	6	P.M.				30 6/100		56	54		7				
	4														
	10	P.M.									1			F. S. by E to S. by E ½ E.	5
Noon	6	A.M.				30 8		53	52						4
	3													M. Do	4
	8									Cum from S. by E.					4
	4														
	9					8/100		55	52	Swell from N.E.	5			L. S. by E ½ E to S.S.E.	4
Noon	12	52° 4′ ☉	26° 15′ ☉	S.E.	10										4
5.	3													F. S.S.E. to S by E.	4
	6	P.M.	Current ripplings *			30 9/100		55	52		6				5
	4					A 56½					3				
	7	A.M.				30 11/100		54	F		2	B light shower		M. S by E.	4
Noon	12							10		Rem. badly graduated	0				5
	3													L. S by E to South & S. by E.	4
	8														
	4														
	9	A.M.				30 13	B	56	52		1				
Noon	12	53° 13′ ☉	21° 20′ ☉	East	31		R	10½		Cum from S.S.W.	1				
	3			with a little southerly											
	8														

* The Barometer is suspended in the wheel house the doors and windows open but not exposed to a current.

Ther: in use Nº Fahr.t / Corrections	REMARKS.	"PROP SKY CLEAR" 0 Entirely overcast 10 Not a cloud to be seen.

1. Water a greenish tint, strong current rips. Towards evening Easterly swell increasing. 6 A.M. There must be bottom here at a few hundred fathoms: the water being the colour of a very light green, such as we often see in shoal soundings.

Species of Mollusca and marine insects, different from those formerly seen. 9 A.M. sky clearer; the colour of the water a beautifull light pea green. By 10.20 the water gradually darkened until 11, when it became Ocean Indigo blue. Swell from E.S.E., N.E. & N.W. Great current rips. Course N.40°E. Distance 143 miles.

2. A little before 1 P.M. we again entered into water of a pea green, resembling the colour over the Bahama Banks and imparting to the sky a deep purple tint. Threw over a bottle, &c. Towards night W. bluish green. A faint Aurora last night. 3 A.M. stood to the S.S.E. 8 A.M. to the N.E. Course N.34°E. Distance 38 miles. A swell from N.W., W.S.W. & N.E.

3. A swell from the E.N.E., N.N.E. & from the Wd. Appearances indicate a northerly wind. Barometer, Mercury falling, swell increasing and atmosphere cooling. Surely we must have a change. 6 P.M. tackd. to the Sd. Untill 12 P.M. the wind veered from East to S.E. by S. 12 tackd. to Nd. & Ed., wind veering to S.E. by S., S.S.E. & S. by E. W. bluish green. A rolling swell from E.S.E. & E.N.E. Weather pleasant. Course N.59°E. Distance 61 miles. Threw over a well corked and copper wired bottle, &c.

4. Pleasant. W. blue green tint. Swell from the Ed. increasing. Latter part abating. A large flock of grey gulls havering around for the last few days. Aurora commenced about 12 P.M. not vivid. Delightfull weather. Course N.66°E. Distance 130 miles.

5. Ocean a beautifull bluish green. Weather pleasant. A moderate swell from the Ed. Five ships in Company, the Garrick out sailing three, one outsailing the fleet. By 7 A.M. the fast ship within two miles astern. Eastern swell subsided. A slight one from N.E. & S.E. The Ship proves to be the Washington, from New York. By 11 alongside, she now holds a better wind, but cannot forereach the Garrick, another ship astern overhauling us. Wind astern fresher and more southerly. Course N.69°E. Distance 189 miles. Water still exhibiting a green tint.

Abstract Log of the Ship Garrick, Captain R. W. Foster

Date.	Hour.	LATITUDE.	LONGITUDE.	CURRENTS. Direction	CURRENTS. Rate	BAROMETER. Height.	BAROMETER. Ther. Attd	THERMR Air	THERMR Watr	FORM & DIRECTION OF CLOUDS.	*PROP OF SKY CLEAR.	HOURS OF FOG A. RAIN B. SNOW C. HAIL D.	MAGNETIC VARIATION OBSERVED.	WINDS. Direction.	WINDS. Rate.
VI															
6	3	P.M.				30 18/100	F.	59			3				
	7	"				30 20/100		62*		Cum light fleecy	8			F. S. by E to S.S.E	4 3
Noon	12	"				" 21/100				from South.	0				2 1
	6	A.M.				" 24/100	B.	55	62					M. E.S.E to S.S.E.	0
	8						W.T.	55		light	09	bank to N.E.			2
	4	Throw over last evening another bottle &c								round to N. W.					
	10					30 23/100		59						L. S.E. to S.S.E.	2
Noon	12	10° 30' A.M.		N.W. by W.	10	30 29/100					5				1
	3														
	8		At 3 A.M. directed the Ship's head to the Sd												
	4		at 11' 30 to Eastward												
	9														
Noon	12	53° 21' ☉	20° 16' ☉	N.W. by W.	10	30 29/100	B	61							
7	3													F. S.E. by S to S.S.E.	1 0 0
	8														
	4	P.M.				" 33/100		63		Except a bank to	10				
	9	"				" 31/100				the Ed like fine fog.				M. 2 A.M. faint	0
Noon	12									Towards evening a bank to the Westd				S.S.E. to South	1
	6	A.M. W	very green			" 29/100		64	52						"
	8														
	4														
	9					" 23/100		55¼	"	Cum passing over	0			L. South to S.S.W.	2
Noon	12	53° 29' D.R.	20° 3' D.R.			" "				the ☉ from N.N.E.	0			& S.W. by S.	2
8	2	P.M.	20° 8' ☉											F. S.W. by S.	3
	6	"				30 14/100		57		Cum from S.S.W.	4				3
	4	Bar. Mercury during the night sinking									2			Light	
	5	A.M.				30 5/100		53	51	W. Blue green	0			M. S.W. by S to	.
Noon	12													S.W. & S.W. by W.	
	3													Moderate,	
	8	40 54° 18'	16° 40'											Studsls low & aloft	
	4									cum from W.S.W.					
	9					30 9/100		54	51		1			L. S.W. by W.	
Noon	12	54° 2' ☉	16° 19' ☉	Southerly*		29 89/100					Hazy			moderate	
9	3														
	8														
	4	P.M.				29 91/100		55	51		0				
	9	"									4			S.W. by W. to F. W. by N. variable	5½ to 7½ Knots
Noon	12	Bar. Mercury falling during the night													
	5	A.M.				29 76/100		52	50		0	B. Drizzly	0	M. W. by N.W. by S to	
	8	W. a bluish green												N.N.W. then to N.N.W.	light
	8	55° 3'	12° 57'	Chr. 13. 7 W.											
	9					29 75/100		54	50	Cum from N.W.	1			L. W.N.W. to N.W. & W.N.W.	Fresh
Noon	12	54° 52' ☉	12° 26' ☉	S.E. ½ E.	17	76/100	Rising				2		3		
	3													with nimbus in the N.W.	
	8													& moderate squalls	

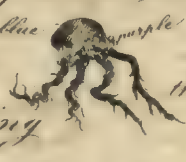
* The suns rays had fallen on the after windows.
* Park no doubt owing to bad steerage.

from New York to Liverpool. 1854.

Therm. in use N.° Fahr.t Corrections	REMARKS.	"PROP. SKY CLEAR" 0 Entirely overcast. 10 Not a cloud to be seen.

6. Wind getting light, an undulation from S.S.W. The wind a short distance astern, probably from that quarter. Ocean smooth. About 4 P.M a swell commenced rolling along from W. N.W. which by 8 increased to a considerable hight. The ☉ set clear in a splendid golden yellow sky. With the Washington & the other Ship*, we have sailed side by side up to the present time viz 8 P.M a sail ahead, raising her pretty fast.
Westerly swell heavy. Ships (9 A.M) continue side by side. Mercury rising with unusual rapidity 10.30 A.M. 30 27/100 Delightfull weather. Course N 68° E Distance 223 miles. A solitary blackfish (small whale) appearing alongside. Fired into it, after which it was no longer seen.

7. A considerable swell from the W.S.W. W. green & transparency. 2 P.M. 33 feet** Ocean alive with animated matter. A scoule of fish from one to 1½ inches in length under the counter and keeping pace with the ship. Presently a solitary fish about four inches in lenght darts amongst them, scattering the scoule in all directions. Course E by N ½ N Distance 227 miles. One sail ahead, overhauling*** her fast, the other ships in company. Passed this forenoon a curious looking Polypuss, about 8 to 9 inches in diameter blue purple 4 legs, white & of great lenght. Should the wind con-



tinue from the Southern quarter, I will decide to pass through the North Channel. Swell from W.d rather subsiding.

8. At 3 P.M passed a sprig of rockweed. Westerly swell continues, a swell from N.W. Saw several sprigs of rockweed. Five sail in Company this afternoon; three hauling up for Cape Clear. 4 A.M Washington and Henry Clay ahead, hull down. Meridian, Washington out of sight. Hold our own with the H. C. Saw a few pieces of rockweed. Ocean smooth. Course N 76° E. 136 miles. Consigned to the Ocean a bottle well corked and copper wired &c. Saw a large whale this morning going North, finally to the S.E.

9. At 1 P.M the wind veered to W by N atmosphere clearing. In about 20 minutes it veered back to W by S with an overcast sky. Both Ships have left us out of sight. 6 P.M sight.d a Vessel ahead. 6 to 12 P.M wind West to W by North, partially clear and pleasant. A swell rolling from N.W. 6 A.M nearly up with the sail, a bark. Course N 73° E. Distance 170 miles.

No weed seen these 24 hours. Passed to Neptune another bottle.

*The Henry Clay. **A white rag the size of the hand attached to the lead.
***A clipper ship. new. By 4 PM up with her.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date VI	Hour	Latitude	Longitute	Currents Direction	Currents Rate	Barometer Height	Barometer Ther Att'd	Therm'r Air	Therm'r Wat'r	Form and Direction of Clouds	°Prop of Sky Clear	Hours of Fog A. Rain B. Snow C. Hail D.	Magnetic Variation Observed	Winds Direction	Winds Rate
10	4	P. M.								Squally					
	9					29 74		50	49	Cum from W.	3	B. In squalls		W. N. W.	
Noon	12													E. strong, squally	
	3													M. strong, squally	
	8														
	4	A. M.				29 68		50	19						
	9													L. moderate	
Noon	12			S.S.W.	20						6				
11	3														
	8	*													
	4	P. M. Mercury sinking						50	51	Between the Island & Lech Folley					
	9														

Wind varying from East to West. Very unsettled & up to 11 P. M. S. W. to S. S. W. 11 P. M. passed Rathlin Island. Beat during the night between that and the Mull of Cantire. Middle and latter parts, strong gales from S. S. W. with steady rain. Split the Foretopsail and outer jib. Robert others.* I expect to see the old Foresail go next. 9 A. M. Mercury down to 29 29/100. At 11 I was astonished to perceive that the mercury had descended to 29 19/100. The sun shining at intervals.

Date	Hour														
Noon	12														
	3														
	8														
	9														
Noon	12														
	3														
	8														
12.	4														
	9														
Noon	12														
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														

from New York to Liverpool, 1854.

Ther in use No Fahr! Corrections.	REMARKS.	*"PROP SKY CLEAR" 0 Entirely overcast. 10 Not a cloud to be seen.

10. Tory Island, N. 80° E. Distant 127 miles. Wd. green. 2 P.M. saw the N.W. point of Ireland, 2 P.M. Tory Island bore South distant 8 miles. The current these last 24 hours has set strong to the Southward.

Weather, Meridian very pleasant. Numerous large whales sporting around the Ship.

11. Pleasant. At 3 P.M. passed Inishtrahull Island Inner passage. The Washington & Henry Clay passed here this morning. We were boarded by a boat from the Island. Exchanged or bartered for fish, potatoes, eggs & milk. Nine families besides the Lighthouse keepers are located on the Island. It contains in a pleasant little valley nine acres of arable land. There are also numerous little patches of verdure, enclosed naturally by basaltic crags, which afford grass for the cattle, these in winter are conveyed to the main land.

At noon between the mouth of Cantire and Glenarm Bay. This Channel is an ugly place in a gale. Nimbus to the N.N.E. & N.E. (Direction)

12. Wintry looking weather. The rain has ceased. Mercury 4 A.M. 29 $\frac{6}{10}$. Wind S.S.W. blowing a double reefed top sail breeze. Air 48, Water 52, Mercury 6 A.M. 29 $\frac{1}{100}$ Heavy Gales. Rathlin Island W. 7 miles. 7 A.M. the wind veered W.S.W. a fine looking sky to the N.W. Mercury immediately commenced rising, reaching 29 $\frac{16}{100}$ where it remained stationary. Wind veering to S.W. & S.S.W. light and blowing in gusts. 11 A.M. passed near to the reef of rocks called the Maidens. Barometer 29 $\frac{16}{100}$. Air 48, Water 49. At noon Mercury the same. Copeland Island bears West distant 9 miles. Will dodge under its lee, untill next flood. Weather pleasant. Wind in the offing South to S.S.W. In shore S.S.W. to S.W. Single reefs. Top gallant sails over. The Washington & Henry Clay in sight from the Isle of Muck yesterday morning. Belfast Pilots.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date	Hour	LATITUDE	LONGITUDE	CURRENTS Direction	CURRENTS Rate	BAROMETER Height	BAROMETER Ther Att'd	THERM.R Air	THERM.R Water	FORM AND DIRECTION OF CLOUDS	PROP OF SKY CLEAR	HOURS OF FOG A RAIN B SNOW C HAIL D	MAGNETIC VARIATION OBSERVED	WINDS Direction	WINDS Rate
VI															
13	4	P.M				$29\frac{17}{100}$									
	6					$\frac{23}{100}$	52	50	48					F. W.S.W. to S.S.W.	strong
Noon	12														
	3									8 P.M. Close under the				W.S.W.	
	8									land to the S.d of Copeland Wind					
	4													veering & hauling	
	9	A.M				$29\frac{20}{100}$	52	49	49	Cum from S.W				to SSW strong at intervals	
Noon	12					$29\frac{18}{100}$	53								
14	3														
	8														
	4														
	9	6 P.M.				$29\frac{24}{100}$	54	52	50						
Noon	12														
	3														
	8														
	4														
	9	A.M				$29\frac{42}{100}$	54							W. S. W. to West	
Noon	12														
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														

from New York to Liverpool 1854

Ther: in use N.º Fahr.t / Corrections	REMARKS.	PROP. SKY CLEAR. 0 Entirely overcast. 10 Not a cloud to be seen.

13 Squally at intervals. There were, 1 A.M. two smart squalls of wind, hail and rain. The squalls generally caused the wind to veer to W.N.W. 2 A.M. passed near to Copeland Island Ship gaining Southing fast against a strong ebb. 4.30 A.M. South Rock light bore West. tack.d to the N.d & E.d Wintry looking weather at times. 7 A.M. to the W.d 11 A.M. tack.d to S.E. South Rock Lighthouse N.W. 7 miles. Noon squally with rain, veering the wind to W.N.W. at one time West. Hope to weather the Calf of Man.

14 Squally & gloomy looking weather. 3 A.M. tack.d to the N.W.; at 6 South Rock Lighthouse bore North by East, distant 10 miles, tack.d to the South.d Wind for the first time since we entered the Channel, West. 12 A.M. Lights on the Calf of Man in range 5 A.M. Received a Pilot off Point Linas. 10.30 A.M. anchored in the port of Liverpool. So ends this tedious passage. Met the Washington off the bar. The Henry Clay arrived last evening.

Abstract Log of the Ship Garrick; Captain R. W. Foster.

Date	Hour	LATITUDE	LONGITUDE	CURRENTS. Direction	Rate	BAROMETER. Height.	Ther Att'd	THERM'R. Air	Wat'r	FORM AND DIRECTION OF CLOUDS.	*PROP. OF SKY CLEAR.	HOURS OF FOG A. RAIN B. SNOW C. HAIL D.	MAGNETIC VARIATION OBSERVED	WINDS. Direction.	Rate.
VII															
3	4	Civil time				Cargo									
	9	395 tons Iron, 59 tons steel This latter is stowed													
Noon	12	amidships, forward of the centre of the hold													
	3	The former is distributed on the coal fore													
	8	and aft, from the Foremast to the Mizen-													
	4	mast, and both affects the Compasses seriously													
	9	The rest of the cargo consists of tin, coal,													
Noon	12	drygoods, casks and crates.*													
4	3	CT. Barometer corrected & compared by													
	8	Messrs. Parkinson & Frodsham, with the													
	4	standard at Liverpool, June, 1854													
	9														
Noon	12					29 52/100	57	58	52						
	3														
	8	N.A. Height of Bar: above the level													
5	4	of the sea 18½ feet													
	9					29 77/100	52½	53	51½		0	B showery			
Noon	12					78/100	53				0				
6	3													E.N.N.W. to N.W. & north	5
	8														
	4														
	9					29 83/100	53	52	51½		0			M north to N.N.W.	5
Noon	12	50° 28' ⊙	8° 42' ⊙	S.S.E.	18	D°	57			Cum from N.N.W.	3				
	3													L. D° D°	5
	8														
	4														
	9										0	B		E.N.N.W. by N.ly W.	6
Noon	12												Showery		
	3										0	B		M. N. by W. to N.	6
	8														
	4														
	9					29 86/100	56½	54	51		2			L. N. to N.N.W.	6
Noon	12	49° 00' ⊙	12° 17' ⊙	S.61E.	50										
8	3					30 3/100	56				0			E. N.N.W. to W.	5
	8														
6	6	AM				30 2/.	57				0				
	9					30 13	55	57	56		8/10			M.N. to N. by E.	5
Noon	12	47° 50' ⊙	16° 39' ⊙	S41W.	29						3/10				
	3													L. N. by E.	4½
	8														
	4														
	9														
Noon	12														
	3														
	8														

*It is a common idea with mates in these ships that westerly variation is greater in going to the Westward, than in going to the Eastward without reference to the iron cargoes.

from Liverpool to New York, 1854

Ther. in use N.° Fahr.t Corrections	REMARKS.	"TROP. SKY CLEAR." 0 Entirely overcast. 10 Not a cloud to be seen

3rd 4 P.M. passed Rock lighthouse. Much rain. Wind W.S.W. blowing heavy. 8 P.M. Wind W.N.W. Dark, gloomy, wintry looking weather.
Passengers, Emigrants, English 86, Scotch 14, Irish 324, other Countries 11, Total 435.

4th Wind moderating. 4 A.M. tack'd off the Isle of Man to the South.d & West.d At noon off Holyhead.
Weather pleasant, atmosphere clearing, Wind, N.W. by W.

5th N.T. Wind light varying from W. to W.N.W. 10 A.M. N.W. moderate, 9 A.M. Tuscar bore W. by N. distant 6 miles. At noon a strong breeze came from N.N.W. Saltees N.W. 14 miles.

6th A swell from West, Weather pleasant, Ocean indigo blue, Course S.46°W. Distance 122 miles.

7th Passed a corked bottle. A high irregular sea. Ship easy;* Course S.61W. Distance 185 miles. W. lightish green.

8th A high irregular sea; gloomy looking weather. 4 P.M. a school of porpoises keeping pace with the ship. Passed this forenoon a singular looking mollusk large as a 20 Gallon Keg. Ocean smooth, W. a bluish green. Course S.63 W. 167 miles.

Local attraction affecting the compasses not less than 1½ points. I much regret not being in possession of an Azimuth Compass. To purchase one for the Ship would be considered as an extravagance not to be pardoned.

* Comparatively so. A law has been enacted limiting Emigrant Ships to a certain weight in cargo and draught of water. An excellent law, as Ships were overburdened with iron cargos and dead weight.

Abstract Log of the Ship Garrick, Captain R. W. Foster

Date VII	Hour	LATITUDE	LONGITUDE	CURRENDS Direction	CURRENDS Rate	BAROMETER Height	BAROMETER Ther Att'd	THERM.R Air	THERM.R Water	FORM AND DIRECTION OF CLOUDS	PROP OF SKY CLEAR	HOURS OF FOG A. RAIN B. SNOW C. HAIL D.	MAGNETIC VARIATION OBSERVED	WINDS Direction	WINDS Rate
	4	P.M.				30 16/100	58				1	Misty			
9	9										0			E. N.N.E. to N.	5
Noon	12														
	3													M. N by E.	5
	6	A.M.				30 10	60								
	4														
	9							59	58		2			L. N by E. to N ½ W.	5
Noon	12	47° 8 D.R.	20°00 D.R.								0				
10	3													E. N. ½ W to N.N.E.	5
	6	A.M				30 27/100	60				2				
	4														
	9					30 30/100	62	61½	60		5			M. N.N.E. to N.E.	6
Noon	12	46° 51' ⊙	24° 19' ⊙	Southerly strong											
11	3	P.M.				30 35/100	63	61	61					L. N.E.	5
	8														4
	4														
	9										8			E. N.E. to N.E. by E	3
Noon	12														
	3													M. Do.	2
	6	A.M.				30 33/100	66								
	4														
	9					" 41/100	68	65	63		9			L. Calm	
Noon	12	46° 56'	25° 9'	Southerly Falling										Faint air W.S.W.	
	3														
	8														
	6														
	9														
Noon	12														
12	3													E. N.W. by W. to W.N.W.	2
	8														5
	4	P.M.				30 40/	68								
	9										0	A at intervals		M. N.W. by N. to North	5
Noon	12								61	Cum. & cir. from W.N.W.					
	3									with great rapidity					
	8														
	6	A.M.				30 35/100	67	falling		rapidly	0				
	9					30 31/100	68	64	62	Under surface 64	3			L. varying north N.W.	5
Noon	12	48° 13' ⊙	25° 31' ⊙	Northerly							5			to N.W. by W	
13	3													E. N.W. by W. to N.W.	5
	8										1				
	5	P.M.				30 28/100	67		62	W. a light green					
	5	A.M.				30 18/100	63	61	60		0	A & misty		M. Do.	5
Noon	9					30 17/	62	60	60	a S. 60½		at intervals			
	[illegible]	W. greenish much agitated by current rips									0			L. N.W. to North	5
	3	19 29 D.R.	24 18 D.R.	A high N.W. sea							0			whole sail	6

from Liverpool to New York 1834.

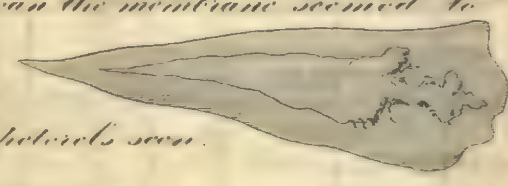
Ther in use No. Fahr! Corrections.	REMARKS.	"PROP SKY CLEAR." 0 Entirely overcast. 10 Not a cloud to be seen.

9. A pair of peterels in the wake. The Ship stirred up in the wake this evening immense quantities of Mollusca, large as an onion, and of a red purple hue. S.W. the colour of a light green & smooth. Course W. by S½S. Distance 134 miles. Consigned to Neptune a well corked & copper wired bottle with the usual request to transmit &c.

10. Weather pleasant. A high swell from the Wd & NE passed this forenoon a branch of Kelp 6 to 7 feet in lenght with many barnacles on one end also rock weed. Course W½S Distance 179 miles. No peterels seen this fore noon.

11 Passed this afternoon a bale of cotton having barnacles on it. also a large log covered with barnacles. A cross swell from S.W. West & N.E. Ocean this morning impregnated with animalcula, also numerous mollusca of a beautifull red & brown. The surface of the Ocean exhibited a species of mollusk enclosed in a brittle membrane, two of these I send to Lieut. Maury. Description: Body encased in a transparent brittle membrane like unto very fine blown glass. Head dark red & purple. Neck beautifully variegated colours. belly a golden yellow. Body in general combines the primitive colours and changable. In skimming the surface of the Ocean the membrane seemed to expand & contract. Myriads of them.

As seen trough the microscope



Course W ¾ N Distance 28 miles. No peterels seen.

12. A high swell from N.E. & from the Westd 12 A.M tackd Ship to the W.N.W. wind hauling Westy 6 A.M tackd to the N.N.E. Latter part Ocean smooth, colour indigo blue. Neither weed nor peterels. Very strong Current ripplings this forenoon. Course N 24° W Distance 57 miles.

13. A swell rising from the Westd 5 A.M tackd to the W.N.W. A few minutes before 4 O'clock A.M passed near to a space of very light green water, about the dimensions of the Ship, not so wide. The Officer of the deck became alarmed and ordered the helm to be put hard a weather to avoid it. This spot could not have been reflected by the sky as at the time there was a dense mist.

Neither weed nor peterels seen. Course N 34° W Distance 90 miles.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date.	Hour.	LATITUDE.	LONGITUDE.	CURRENTS. Direction	Rate	BAROMETER Height.	Ther. Att'd	THERM'R Air.	Wat'r	FORM AND DIRECTION OF CLOUDS.	*PROP OF SKY CLEAR.	HOURS OF FOG A. RAIN B. SNOW C HAIL D.	MAGNETIC VARIATION OBSERVED.	WINDS. Direction.	Rate.
VII	4	P.M.				30 23/100	62	60	60	W. green					
11	9													F. North to N.W.	5
Noon	12									Great humidity	0				4
	3													M. N.W. to N.W. by W.	4
	6	A.M.				30 16/100	62				0	misty			
	4														
	9					30 11/100	64	64	62	Air very humid	5			L. N.W. calm	
Noon	12	49°30⊙	27°55⊙	Sd. Wd.										& N.N.W.	5
15	3														
	5	P.M.				30 3	66				0	B intervals			
	4														
	9					29 97/100								F. West to W.S.W.	6
Noon	12					29 77				Cum & Cirs flying					
	3									by the moon from				M. W.N.W. to N.W.	
	8	A.M.				29 43/100	60	59	60	W.N.W. with amazing rapidity	0			strong gales	
	4														
	9													L. N.N.W. Gales	
Noon	12	50° 7 D.R.	29° 31 D.R.												
16	4	P.M.				29 89/100	60		60	Cum from				F. N.N.W. Gales	
	8									N.N.W.				to N.W. by N.	
	7	A.M.	Current, of course			30 30/100	62								
	9	"	strong to the Sd. & Ed.			30 31/100		58½	60					M. N.N.W. to N. by W.	
Noon	12	47°51⊙	30° 20⊙											more moderate	
	3													L. North, Fresh N.N.W.	
	8													gales, moderate	
17	6	P.M.				30 13/100	64			Cum from W.N.W.					
	8													F. N.N.W. to N.W.	5. 4
Noon	12													calm	
	5	A.M.				30 7/100	63½							M. W.N.N.W. to S.W.	3
	7					29 90/100	64							by W.	6
	4					29 82/100	67	66	63			B			
	9											B		L. W.S.W. to West to	
Noon	12	48° 8' D.R.	31° 28' D.R.								3			W.N.W. gales	
18	1.30	P.M.				29 63/100	Rising rapidly								
	8														
	4	P.M.				29 81/100	63								
	6	"						58	60			misty		F. W.N.W. to gales	
Noon	12													N.W. moderating	
	5	A.M.				30 4/100	62				4			M. N.N.W. moderate,	
	8										misty at intervals			a heavy cross sea	
	4					30 7/100	63	62	62						
	9										0	Light showers		L. N.N.W. to West	
Noon	12	48°30'⊙	32° 44⊙			2/100	64			Cum & Cir from N.W.				Moderate N.N.W.	
	3										5			or a fresh breeze	
	8														

from Liverpool to New York. 1854.

Ther in use N° Fahr! / Corrections	REMARKS.	[illegible]

14. Early part of the evening Aurora faint. 11 P.M. tack.d to N. [illegible] A.M. to W.S.W. 10.30 stood to N. by E. 26°. Neither weed nor peterels seen. Course N. 64° W. Distance 48 miles. Weather pleasant

15. Weather unsettled. At midnight the wind veered suddenly W.N.W. A very high and irregular sea. Ship under double reefed T.S.ls and reefed courses. W. deep blue. Course N. 65° W. Distance 64 miles.

16. Strong gales. Sea high and irregular. Passed Vessels bound to the Eastd under close reefed Topsails. Neither peterels nor weed. Weather pleasant. Under full sail. W. indigo blue. Course S. 13° W. Distance 136 miles. Current & deviation of Compasses

17. Towards evening the wind began to fall. 8.30. P.M. breezing up from the W. & backing against the sun, a sure indication here of unsettled weather. I have long fully appreciated the value of the Barometer. From 5.30 to 8 A.M. heavy rains, the wind blowing in violent gusts. From 8 untill 10 A.M. apparently settled. Mercury sinking fast. At 11 the gale began to increase. Close reefed the top S.ls and veered Ship to the S.S.W. At noon a heavy gale. Ship under close reefed Main topsail and storm fore and aft sails. Passed two sprigs of Rock weed. Peterels about last evening. Course N. 69° W. Distance 49 miles.

18. Heavy gales. Sea running high especially from West round to N.W. Towards evening moderating. A high irregular sea. Latter part swell N.N.E. & S.E. Passed Polypusses
Weather apparently unsettled. Heavy condensing air flow to the Nd & Wd. The lower strata seems to proceed from fogs. Course S. 30° W. Distance 113 miles.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date VII	Hour	Latitude.	Longitude.	Currents. Direction	Currents. Rate	Barometer. Height	Barometer. Ther Att'd	Thermr. Air	Thermr. Wat'r	Form and direction of clouds.	Prop of sky clear	Hours of Fog A. Rain B Snow C. Hail D.	Magnetic variation observed.	Winds. Direction.	Winds. Rate.
19	4														
	9										2			F.N.W.to W.N.W.	5
Noon	12														
	5	A.M.				30 5/100	65			Cum from W.N.W.				M. W. by N. to N.W.	5
	8											misty			
	4														
	9		☉☾ 33° 39′			30 7/100	66	65	62		7			L. N.W. by W.	5
Noon	12	46° 27′ ☉	33° 21′ ☉								5				
20	3													F. N.W. to W.N.W.	5
	8	P.M.				30 4/100									4
	4	A.M.				29 55/100						B			
	9													M. W.N.W. to W.S. W.S.W.	4
Noon	12									Heavy rains					
	3											B		L. W.S.W. to South & calms	4
	8	A.M.				29 60/100	66								
	4													Faint airs N.E.	
	9					29 36/100	66	64½	63	Under surface 62					
Noon	12	46° 36′ D.R.	34° 50′ D.R.			29 51/100	68					B misty			
21	3.30	P.M.				29 45/100	68							F. West, light calm	
	8											A. N.		E.N.E.	6
	4											B			
	7.30					29 62/100	64			Cum from N.E.		Dry		M. E.N.E. to N.E.	5
Noon	12														
	3													L. N.N.E. to N.E. by N.	1
	8														3
	4	A.M.				29 98/100	60				4				
	9					30 3/100	64	62	63		6				
Noon	12	46° 32′ ☉	38° 7′ ☉												
22	3													F. N.E. by N. to E.N.E.	3
	8														2
	4	P.M.				30 8/100	64	62	63		7				
	9													M. E. to S.E.	2
Noon	12														
	3	A.M.				30 9/100	62							L. S.S.E. to S.W.	5
	8										6				
	4														
	9					30 32/100	65	64	64	10. 30 Mercury sink					
Noon	12	46° 6′ D.R.	39° 36′ D.R.			30 18/100	68				0				
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														

from Liverpool to New York, 1854.

Therm use N° Fahr.t / Corrections	REMARKS.	"PROP. SKY CLEAR." 0 Entirely overcast. 10 Not a cloud to be seen

19. 8 P.M. tack.d Ship to the N.d 1.30. A.M. to the S.W. 8 " to N by E. Passed this forenoon sprigs of Rockweed. Weather pleasant, though apparently somewhat unsettled. No petrels seen. A swell from N.W. Course S. 84° W. Distance 27 miles.

20. Weather apparently pleasant, though appearances in the atmosphere indicate an unsettled state or commotion. Heard to night the shrill sharp chirp of the petrel. P.M. great quantities of Rockweed sprigs. Petrels in the wake. Course N. 64° W. Distance 68 miles. Threw overboard a bottle with Ships position &c. with the usual request, if found, to forward it to Lieut. M. F. Maury, U.S.N. Washington.

21. Weather unsettled indicative of a change. Much rockweed. Passed a large log, one end of which had been sawed. At 3.45 the breeze came from E.N.E. blowing fresh with rain. 3. Mercury began to rise. A heavy West.y swell. Strong winds. Towards sun down moderating, all sail, a continued Westerly swell. Passed this morning a 3 inch plank. Numerous sprigs of rockweed and one piece of gulfweed, quite fresh. Weather very pleasant. Course S. 79° W. Distance 137 miles.

22. Weather pleasant; a irregular swell from N.E. & W. Great quantities of a singular looking Mollusk, one to four feet in lenght, and four to five inches in breadth. Many in coils  Serrated parts deep red; other parts yellow and green. Also greyish coloured serpents, some six feet in lenght; contracting & expanding. Procured a part of one of the former for Lieut. Maury.* Latter part, atmosphere unsettled. Petrels about last night.
Course S. 68° W. Distance 87 miles.

* By sinking a small cord some fell across it but invariably were cut in two parts. Ocean litterally alive with them

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date	Hour	LATITUDE	LONGITUDE	CURRENTS		BAROMETER		THERM^R		FORM AND DIRECTION OF CLOUDS	PROP OF SKY CLEAR	HOURS OF FOG A RAIN B SNOW C HAIL D	MAGNETIC VARIATION OBSERVED	WINDS	
VII				Direction	Rate	Height	Ther Att^d	Air	Wat^r					Direction	Rate
23	4									Cum from West					
	6	P.M.		$30\frac{8}{100}$	68							B light		F. S.W. by W. to West	5
Noon	12														
	7	A.M.		$30\frac{8}{100}$	63						4	mist at intervals		M. W. by N. to W.N.W.	In gusts
	8														
	8									N. W. by N.	0				
	9				64			62	64		1			L. N.N.W. strong at intervals	
Noon	12	45 16′ ⊙	41 21 ⊙												
24	5	P.M.				$30\frac{10}{100}$	62							F. N.N.W. to North	Strong at intervals
	8							58	68		0				
	7	A.M.				$30\frac{15}{100}$	60							Strong at intervals	
	9					$30\frac{20}{100}$	61	59	67	Cum from N.W.	0			M. D^o in gusts	5
Noon	12	44° 07 D.R.	44°56′ ⊙	Southerly							′20				
	3													L. N to N.N.E. moderate light	
	8														
25	4	P.M.				Rising		60	66						
	9													F. N.N.E. N to N.N.W.	4 2
Noon	12														calm
	3													M. Calm	
	8														
	4														
	9	A.M.				$30\frac{33}{100}$	68		66		6			L. Calm cats paws E to S.S.E.	
Noon	12	44°11′ ⊙	46°52 ⊙	N.N.E.							3				
26	5	P.M.				$30\frac{35}{100}$	69							F. Calm light N.E. to South S.S.W.	
	8										0				
	7	A.M.				$30\frac{35}{100}$	66	65	62						
	9					$30\frac{31}{100}$	70				0	A light		M. S.S.W. to S.E. S.S.E. Faint	
Noon	12	44 39 D.R.	18 53 D.R.*	17 miles north							0		moderate		
	3											A	dense	L. Calms S.E. to S.W. faint	
	8														
	4														
	9														
Noon	12														
27	5	P.M.				$30\frac{34}{100}$	64	64	62		0	A misty		F. Calms N.N.E.	2
	8														3
	4														
	9										0	A		M. N.N.E. faint calm	
Noon	12														
	3										0	A		L. E.N.E. to W. ½ calm	
	8														
	4								54		0				
	9					$30\frac{30}{100}$	66	63	54	Clearing					
Noon	12	43°55′ ⊙	49° 12												
	3														
	8														

*Position too far West. The current the preceding 24 hours must have set to the N^d & E^d.

from Liverpool to New York 1854.

Ther. in use No. Fahrt. Corrections	REMARKS.	PROP. SKY CLEAR 0 Entirely overcast 10 Not a cloud to be seen

23 Atmosphere indicates a change of Wind. At 11 A.M. the wind veered N.N.W. 1 P.M. a dense fogbank in the South. The lower strata of clouds proceeds from dense fogs in the N.W. quarter. Rock weed and peterels. Course N 86° W. Distance 90 miles.

24 Wintry looking weather, a high swell from the N. Rock weed & peterels Course S 60° W. Distance 168 miles.

25 A tumbling swell from the Nd & Ed. No Rockweed seen. Many tuffs of Gulfweed, Polypusses and Mollusca. Many peterels. Course N 87 W. Distance 84 miles.

26 A tedious time. Many Mollusca Procured two of a species which I intend for Lieut. Maury. Rock weed, Gulf weed and many peterels. Passed this morning a monster Mollusk of the same species we saw on the 22nd Inst. full ten feet in length and a foot in breadth. A school of bottle nose whales sporting around the Ship. Course W. by N. 60 miles.
Transparency of water 36 feet. Threw over a bottle with the usual request.

27. 3 A.M. a faint breeze came from the N.N.E. Immense quantities of sea fowl feathers. Passed from 5 A.M. until dark trough continued collections, Ship going 4 miles per hour. From 5 to 12 A.M. almost calm below all sails aloft clean full. Several large whale playing round the Ship. In 55 fathoms very white sand, Specimen I will forward to Lieut. Maury. Course
Distance . Numerous peterels.

Abstract Log of the Ship Garrick, Captain R. W. Foster

Date.	Hour	LATITUDE.	LONGITUDE.	CURRENTS Direction	CURRENTS Rate	BAROMETER Height.	BAROMETER Ther Att'd	THERMR Air	THERMR Wat'r	STORM AND DIRECTION OF CLOUDS.	PROP OF SKY CLEAR	HOURS OF FOG A. RAIN B. SNOW C. HAIL D.	MAGNETIC VARIATION OBSERVED	WINDS. Direction.	WINDS. Rate.
VII															
28	4										0				
	6.	30 P.M.				30 15/100	62		59		0	B heavy	at intervals.	F. Calm	
Noon	12													SW. to SW. by S.	3
	3											A dense		M. S.W. by S.	3
	8														4
	4	A.M.							58						
	9					30 5/100	70	67	64			A dense		L. S.W. by S. ½ S.	4
Noon	12	43° 43′ ⊙	52° 6′ ⊙	W. N.W						At noon clear					
29	3													F. S.W. to W.S.W.	4
	8														
	4	P.M.				30 8/100	72	72	64						
	9													M. North strong	
Noon	12														
	6.	30 A.M.				30 9/100	69	69	70		10				
	8														
	4														
	9					30 9/100	71	68	68	Beautifull cirrus				L. North moderating	
Noon	12	42° 55′ ⊙	56° 15′ ⊙	W.S.W.	26				70	many in form like	9			light	
	3									the Cornucopia, going to		the N.E.			
	8														
30	4														
	6	P.M.							70		10			F. N.–N. W. N. W. by W.	light
Noon	12														
	5	A.M.				30 18/100	69		70		6			M. Calms	
	8														
	4														
	9					30 35/100	73		72					L. Calms,	
Noon	12	43° 9′ ⊙	55° 20′	E.N.E.	42	" "	79				8			H. faint from South	
31	3													F. South, light S.S.W. moderate	
	8	P.M.							66						
	4														
	9													M. S.S.W. to S.W. by S.	4
Noon	12														
	6	A.M.				29 98/100	72		66		0			L. S.S.W.	4
	8														
	4														
	9					29 95/100	73		66						
Noon	12	42° 49′ ⊙	57° 6′	Southerly.		86	74				2/10				
	6	Strong current rips							66					F.	
	8	and whirl pools.									0				
	4	A.M.							70		″				
	9					29 8/100	68		70		0			M. N.W. to N.N.W.	4
Noon	12	42° 00′ ⊙	58° 55′								1/10				
	3													L. N.N.W. to N. by W.	4
	8														

Ther. in use N° Fahr.t Corrections.	REMARKS.	"PROP. SKY CLEAR" 0 Entirely overcast 10. Not a cloud to be seen.

28. Many large whales sporting 3 P.M. the breeze sprung up from S.W. Passed a Schooner at anchor. Current setting to the Northward. Course true up to 6.30 P.M. West 16 miles. Temp.re of water from 54° changed to 59°. A gentle undulation from the W.d Ocean smooth. Passed a binnacle with a brass top to it. Strong current rips. Course S 84° W. Distance 126 miles.

29. 2 P.M. wind veering Westerly. A high westerly swell commences. Current rips strong Sultry, indicative of a change. 8.30 P.M. the wind veered, or came from North. Passed this forenoon a large square stick of timber. Some Rockweed, abundance of Gulfweed. Weather delightfull. Course S 75° W. Distance 189 miles.

30. Pleasant. 6 P.M. tack.d to N. by E. Aurora Borealis faint. Ocean smooth. Course Distance

31. Entered into a heavy Westerly sea. A beautifull ariel sun set scene; latter very sultry. Nimbus gathering in the N.W. Distant thunder in that quarter. Course N. 75° W. Distance 79 miles.

August 1.st Shortened sail. Much lightning and heavy rains at intervals, wind flying from North to S.W. 3 P.M. wind S.W. by S. Calm with a heavy S.W. by S. sea. 8 P.M. the wind came from N.W. In the Stream much Gulfweed. Course S 60° W. Distance 98 miles. Petorels.

Abstract Log of the Ship Garrick, Captain R.W. Foster

Date VII	Hour	Latitude	Longitude	Currents Direction	Currents Rate	Barometer Height	Barometer Ther. Att'd	Therm. Air	Therm. Water	Form and Direction of Clouds	Prop. of Sky Clear	Hours of Fog a, Rain b, Snow c, Hail d	Magnetic Variation Observed	Winds Direction	Winds Rate
2	4	P.M.							70						
	9										10			E.N.N.W. by N.W.	4.
Noon	12													calm	light
	3													M. calm	
	8														
	4														
	9					30 5/100	71		71	Cum. from S.W.	5			L.W.S.W.	3
Noon	12	41 41 ⊙	61°15′ ⊙			falling					0			Do	4
3	3													F.W.S.W.	4
	8														
	4	P.M.				29 52/100	75		68						
	9									From N.W. by the	0			M.W.S.W. to West	4
Noon	12					29 54/100				moon	0			N.W.N.W.N. calm	
	5	A.M.				52/100	69		63		6			L. calm N.N.W.	
	8										8			light to W.N.W.	
	4														
	9					29 52/100	76		62		10				
Noon	12	42°29′ ⊙	62°30′ ⊙												
4	3										10			F.W.N.W. to W. by N.	
	8													strong	
	4														
	9									Aurora, not very brilliant				M.N.W. by W. moderate	
Noon	12	P.M.							65						
	3	A.M.							66						
	6								63		4				
	4														
	9					29 30/100	68		68	9 20 W. 74				L. West moderate	
Noon	12	41°36′ ⊙	63 00 Chro.			falling			63						
	3														
	8										0				
	4										0				
	9														
Noon	12														
5	3													F.W. to W.S.W. light	
	8	P.M.									0			S.W. faint	
	4										0				
	9									Cum going to the					
Noon	12									moon from the W.N.W.					
	6	A.M.				29 54/100	68		64			B		M. Calm S.E. light	
	8														
	4														
	9					29 [illegible]/100	68		63			A dense		L.S. to S.W. light	
Noon	12	41°58′ ⊙	64°40′ D.R.											N.E. moderate	
	3		Current southerly strong							Cum going by the	0	Hazy			
	8		64 45 D.R.							Sun from the West	d				

from Liverpool to New York, 1854.

Ther in use N° Fahr^t / Corrections	REMARKS.	"PROP SKY CLEAR / 0 Entirely overcast / 10 Not a cloud to be seen

2. A continued head or Westerly sea. Towards evening abating. At 5 P. M a breeze sprung up from W. S. W. Much Gulfweed. Weather pleasant. Ocean smooth. Course S. W. Distance 120 miles. Petrels.
This day a female child was born of English Parentage. It is named Virginia Garrick Brown.
A land bird alighted on board, species unknown.

3. Saw a flying fish. 1 P. M. emerged from the Stream. W. 68°. Powerfull current rips. After leaving the stream entered into a Westerly sea. W. 7 A. M. 61°. 8 A. M. 68°. Unsettled. 9 A. M. much lightning in SW & West quarters; also, in the N. E. A heavy shower of rain: a heavy W. N. sea. Latter part strong current ripplings. Weather pleasant. The Westerly sea subsides. Course N. 30° W. Distance 42 miles. Caught a land bird, yellow breast. Petrels.

4. 2.30 A. M. tack^d Ship to the N^d & to the S. ^d & W^d. Powerfull current rips. appear at times like broken water. A Westerly swell. At 9.30 A. M. entered into the Stream. W. 74°. Tack^d to the N. N. W. Much Gulf and rockweed on the edge of the stream. A dense fogbank in the Northern quarter. Ocean smooth. Weather pleasant. Course Distance Petrels. Notwithstanding the powerfull current ripplings which have prevailed these 24 hours, the Ship has made no more Westing than the courses and distances have given. I therefore am inclined to believe, that there has been a regular flux and reflux of the Ocean tides.

5. Ocean exceedingly agitated by current rips. W. greenish blue. At 9 A. M the wind came suddenly from N. E. Rock & Gulfweed, Petrels. Course by Compass N. 78° W. 85 miles. True S. 67 W. Distance 85 miles. Suppose the Current to set S. S. W.

Abstract Log of the Ship Garrick, Captain R. W. Foster.

Date. VIII	Hour	Latitude.	Longitude.	Currents. Direction	Currents. Rate	Barometer. Height	Barometer. Ther. Att'd	Therm. Air	Therm. Water	Form and Direction of Clouds.	*Prop. of Sky Clear.	Hours of Fog A, Rain B, Snow C, Hail D.	Magnetic Variation Observed	Winds. Direction.	Winds. Rate
6	3	P.M.	65 17' ⊙												
	6								58					E.N.E. to N.N.W. light	
Noon	12								59			A	Dense		
	3											A		M.N.N.W. faint	
	8														
	4														
	9	W. a bluish green				30 4/100	64		59				Hazy	L.N.N.W. to N.W.	
Noon	12	41° 14' ⊙	66 16' ⊙			falling					Partially			faint	
7	2.	30 P.M.							70			A		F.N.W. to West	
	3								64					faint	
	4					29 [illegible]/100			61						
	9					29 [illegible]/100	62		59	W green	clearing	Hazy		M.W.S.W. to S.W.	4
Noon	12	41° 9' ⊙	68° 5 c	Very strong current rips							5			& West	
	3													L. West to W.S.W.	
	8													& W.N.W. moderate	
	4														
	9													F. West to S.W.	
Noon	12													S.W. faint calms	
8	3													M. Calms	
	8										9				
	4														
	9		68° 35 c			30 [illegible]/100	71		68	In 52 fathoms water				L. 5 A.M. E.N.E. faint	
Noon	12	40° 35 D.R.	68° 10'								0			Calms, 11 A.M. N.E.	2
	3														
	8														
	4														
	9														
Noon	12														
	3														
	8														
	4														
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Noon	12														
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Noon	12														
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	8														
	4														
	9														
Noon	12														
	3														
	8														

from Liverpool to New York, 1854

Ther in use No Fahr Corrections	REMARKS.	"PROP SKY CLEAR" 0 Entirely overcast 10 Not a cloud to be seen

6. Passed this afternoon much wilted grass. Ocean smooth. Passed this forenoon green grass, straws, pieces of wood, chips, much rock weed and other substances. Calm below, a light breeze aloft. Course S 46° W. Distance 63 miles.

7. At 5 bells A.M. entered into the stream. W.T. 70°; tack'd to N.N.W. & shortly the W.T. fell to 64°. When we entered the stream, the atmosphere cleared immediately after the W.T. falling to 64°. Foggy. At 0.30 P.M. sounded 22 fathoms, the ground forward to Lieut. Maury. Tack'd to the Southd. Weather pleasant; Atmosphere a little hazy, Ocean smooth. In 28 fathoms, coarse sand, yellow, black & white gravel, which forward

8. At 6 A.M. saw a pilotboat to the Westd. At 10.30 A.M. received a pilot

9. First part light winds from N.E. by E. Part of the middle part calm. Latter part wind strong from E.N.E.

Latitude obsd 40° 9' N.
Longitude 71° 34' Chro

A strong southerly current. 7 P.M. passed Fire Island.
10 P.M. saw the Highland lights.

Early in the morning of the 10th arrived at the City

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